The Electrical Industry's Weekly Magazine

September 8, 1958

Electrical World

Price 50 Cents

A McGraw-Hill Publication

Are Reactors Safe?

AEC Strives to Make Them So ...P 68

U. S. Power Men Wind Up Russian Tour . . . p 56

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TODAY'S RESEARCH AND TOMORROW'S POWER

G.E.'S THERMIONIC CONVERTER, as a major power producer is a long way off. Pure research, however, is paying off in new ideas for improving today's generating equipment. Immediate gains are being achieved through research and development on . . .

TECHNOLOGICAL PROGRESS

General Electric's "across the board" approach to scientific research in the development of new sources of energy for generating electricity is expected to yield immediate as well as long-term improvements in power generation equipment.

TWO LONG-TERM PROSPECTS for generating electricity which appear technically and economically feasible in the years that lie ahead are—fission power and fusion power.

In addition to continued technological progress in these areas, intensive research is also being carried on to develop and utilize even more novel sources of energy—the fuel cell, direct conversion of solar energy to electricity, and the thermionic converter.

Investigations in these and other areas will undoubtedly produce unexpected payoffs which can have almost immediate application. The search for fusion power, for example, could lead to by-products in circuit technology or radiation generation long before fusion energy is harnessed for peaceful use.

SIGNIFICANT PROGRESS has already been achieved in the liquid cooling of generator stators. The nation's first large turbine-generator with water-cooled stator windings is now being manufactured by General Electric. The two generators of this cross-compound unit are each rated 265,000-kva at 30 psig hydrogen pressure.

. . . longer last-stage buckets

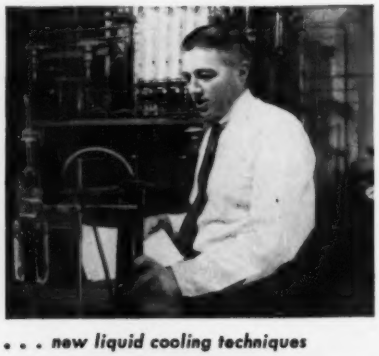
Water has over twice the heat removal ability of oil. Its use as a liquid coolant will help to open up avenues for: 1) the building of generators of up to one million kva capacity while retaining the basic design simplicity of conventionally-cooled units, 2) significant savings in power plant construction costs, and 3) overcoming the limitations on higher generator ratings imposed by current shipping restrictions.

BENEFITS TO ELECTRIC UTILITIES—By searching for new knowledge and capitalizing on existing technological opportunities, General Electric is striving for turbine-generator advances that will continue to result in low operating costs per kilowatt-hour of electricity produced. Exploring all possible avenues for technical innovations and product improvements also helps electric utilities to satisfy their needs for increased power capacity. Also, these General Electric research programs mean added value-in-use for G-E steam turbine-generators operated by electric utilities.

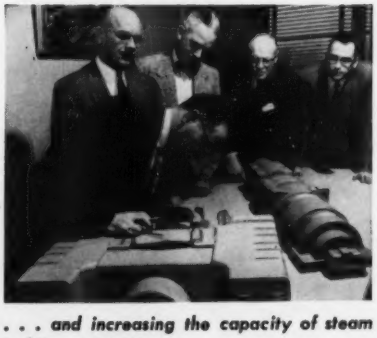
FOR MORE INFORMATION on today's research and tomorrow's power at General Electric, contact your local G-E Apparatus Sales Office or write for Bulletin GP-81. General Electric Company, Section 301-388, Schenectady 5, N. Y.

MORE POWER TO AMERICA

GENERAL ELECTRIC



. . . new liquid cooling techniques



. . . and increasing the capacity of steam turbine-generators.

Electrical World

Vol. 150, No. 10 SEPTEMBER 8, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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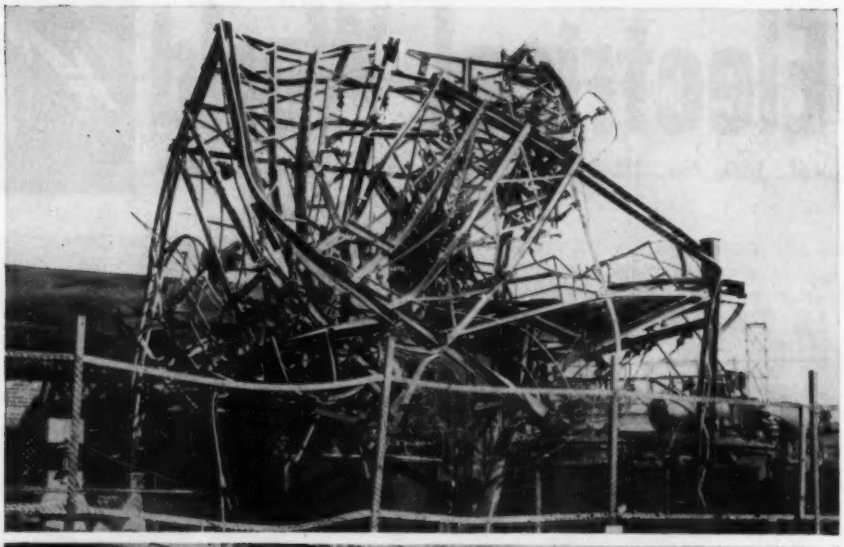

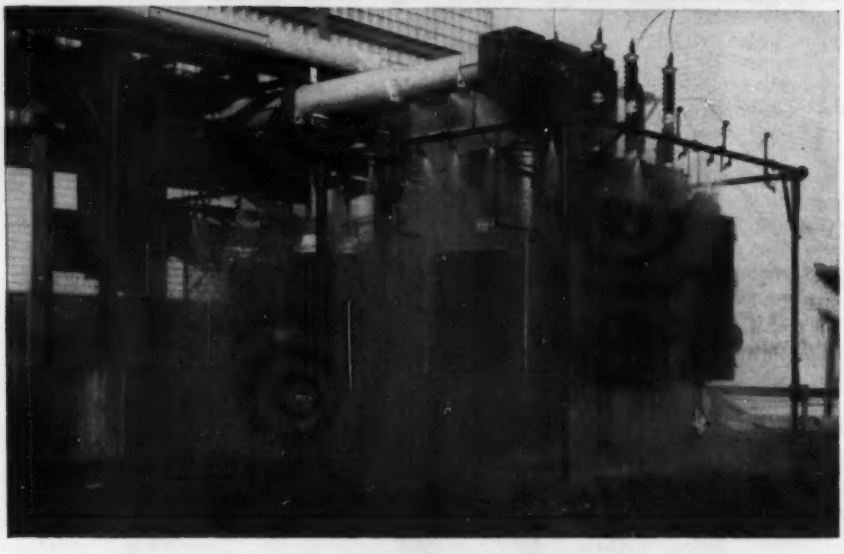

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- Special Hazard Fire Terms Defined
- Water Spray Systems
- Selfcon Water Spray Systems
- Foam Systems
- Carbon Dioxide Systems
- Dry Chemical Systems
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Write for your complimentary copy today. Grinnell Company, Inc., 277 West Exchange St., Providence, R. I.

GRINNELL

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Manufacturing, Engineering, and Installation of Fire Protection Systems since 1870

Should We Abolish Speeches?

"Autumn approaches and the business world prepares to pick up its tempo. This means lots of things. More conferences, more paper work, more burning of midnight oil, and more dinner speeches. The dinner speech lingers on as one of the empty rituals of corporate society. Like the appendix, it serves no real function and brings pain when it comes out. - - - There is at least one fault with the luncheon speech and the dinner speech. Nobody remembers what the speaker said five minutes after he sits down."

This quotation is from Donald I. Rogers' column appearing in the New York Herald Tribune. I guess we will all have to agree that there is much truth in this statement. Frequently being one of the culprits, I am particularly interested in Mr. Rogers' observation.

My one suggestion would be—let's quit asking luncheon and dinner speakers to be entertainers. If there is an important subject to discuss, have someone in the field present his ideas. If it is to be entertainment, hire an entertainer.

Fischer Black

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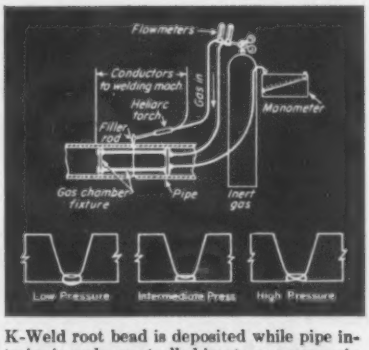
KELLOGG'S K-WELD® TECHNIQUE KEEPS PACE

During shop fabrication, *ninety* K-Welds . . . Kellogg's inert gas shielded technique of manual arc welding . . . were made by Kellogg on the Type 316 stainless main steam piping for Philadelphia Electric Company's Eddystone Station, Unit No. 1. All were heat treated after welding, at 1900-1950 F.

In the photo above, the K-Weld root bead already has been deposited —using 1/16 in. filler wire (16 Cr.-8 Ni.-2 Mo.). The operator is making the second pass by conventional manual arc welding. This and the remaining passes are made using covered electrodes (B&W 16-8-2) for this extremely heavy-walled section.

Inspections by liquid penetrant and radiography . . . *four for each weld* . . . were as follows: (1) After the first ⅝ in.; (2) Halfway between ⅝ in. and outer surface, provided the distance was greater than ¾ in.; (3) On completion of weld; (4) After solution heat treatment. These inspections show the extent to which Kellogg goes, beyond code requirements in this case, to control quality of fabrication.

The M. W. Kellogg Company welcomes inquiries on its complete service to the power piping industry from consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.



K-Weld root bead is deposited while pipe interior is under controlled inert gas pressure in specially designed portable gas chamber fixture. Diagram shows details of fixture, and how interior weld surface can be controlled by varying pressure.

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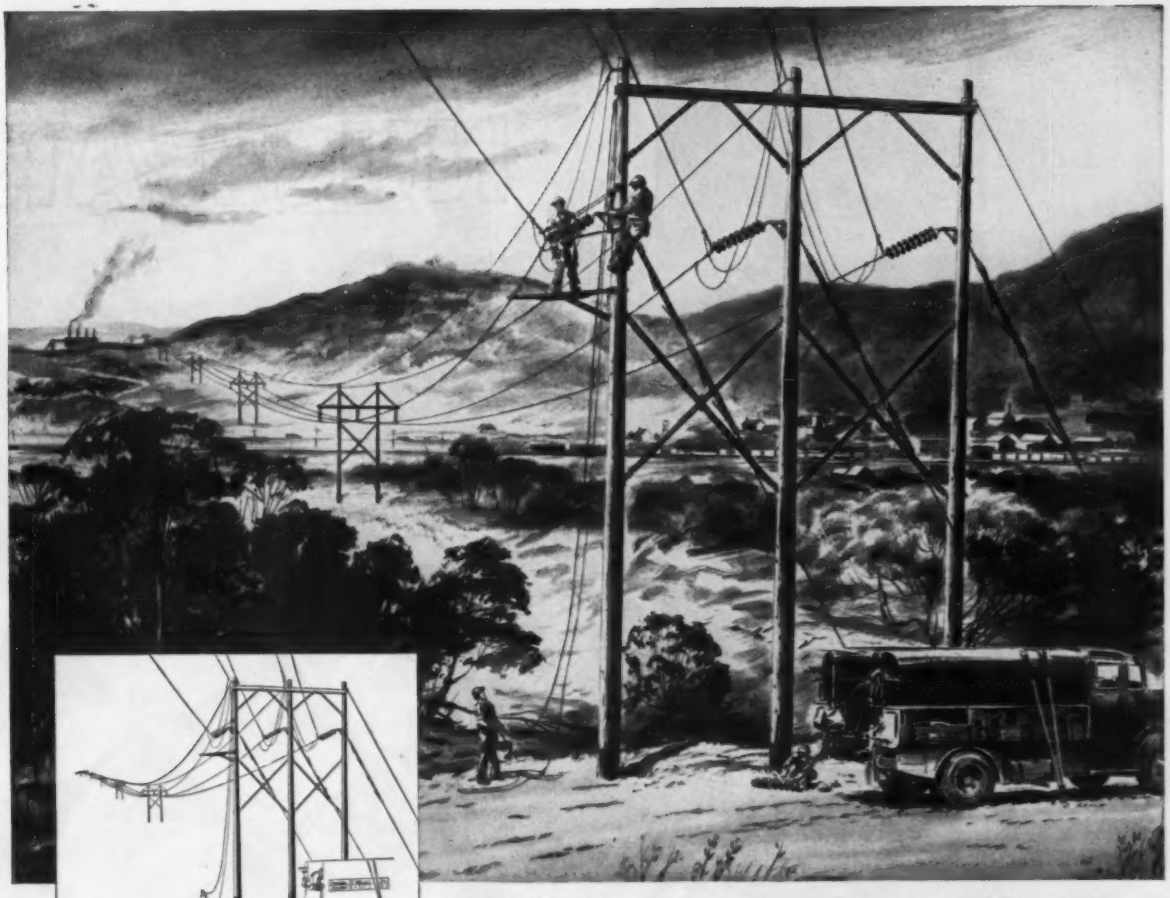
POWER PIPING—THE VITAL LINK



You can get prompt help with any outside construction problem through your Graybar office. In over 130 cities there are Graybar offices and warehouses ready to fill your every need for line materials, hardware and tools. And through any of these offices you can get the help of Graybar Outside Construction Specialists, strategically located in 19 principal cities, equipped by training and experience to give you prompt, dependable help.

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Line building can challenge the skill and ingenuity of the best transmission engineers. When the line runs through rugged country, when the specifications are precise, take full advantage of the broad facilities and specialized experience of Graybar. No matter where your job site may be located, no matter what new requirements may be presented in tensions, insulation and erection, call on Graybar for engineering assistance as well as all your transmission line materials and supplies. If you would like to see our bulletin on High Voltage Transmission Line Materials, and you are located in the U. S. or its possessions, write us for your copy. It's complete with illustrations, applications and specifications. It is free, of course. 710

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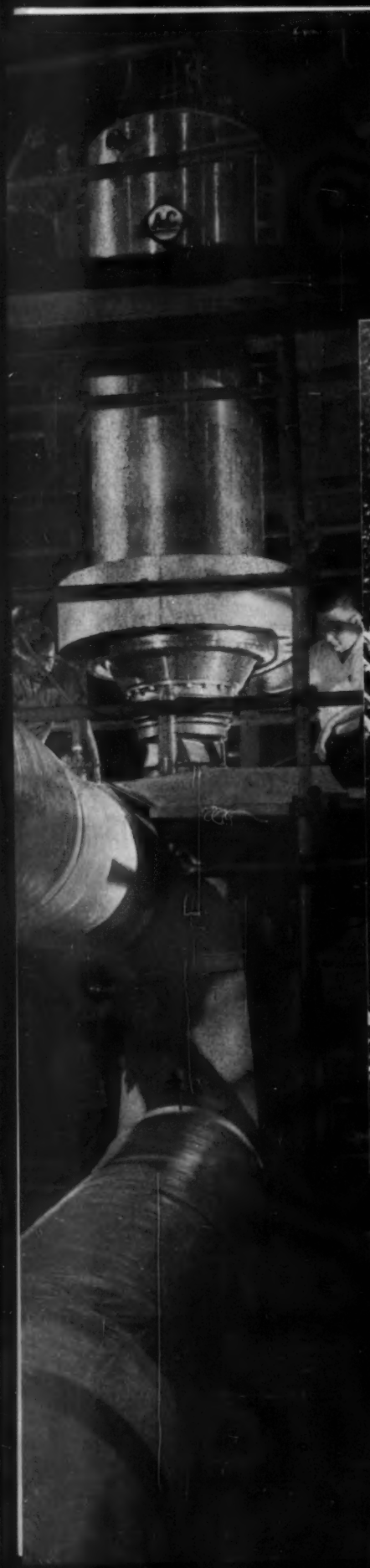
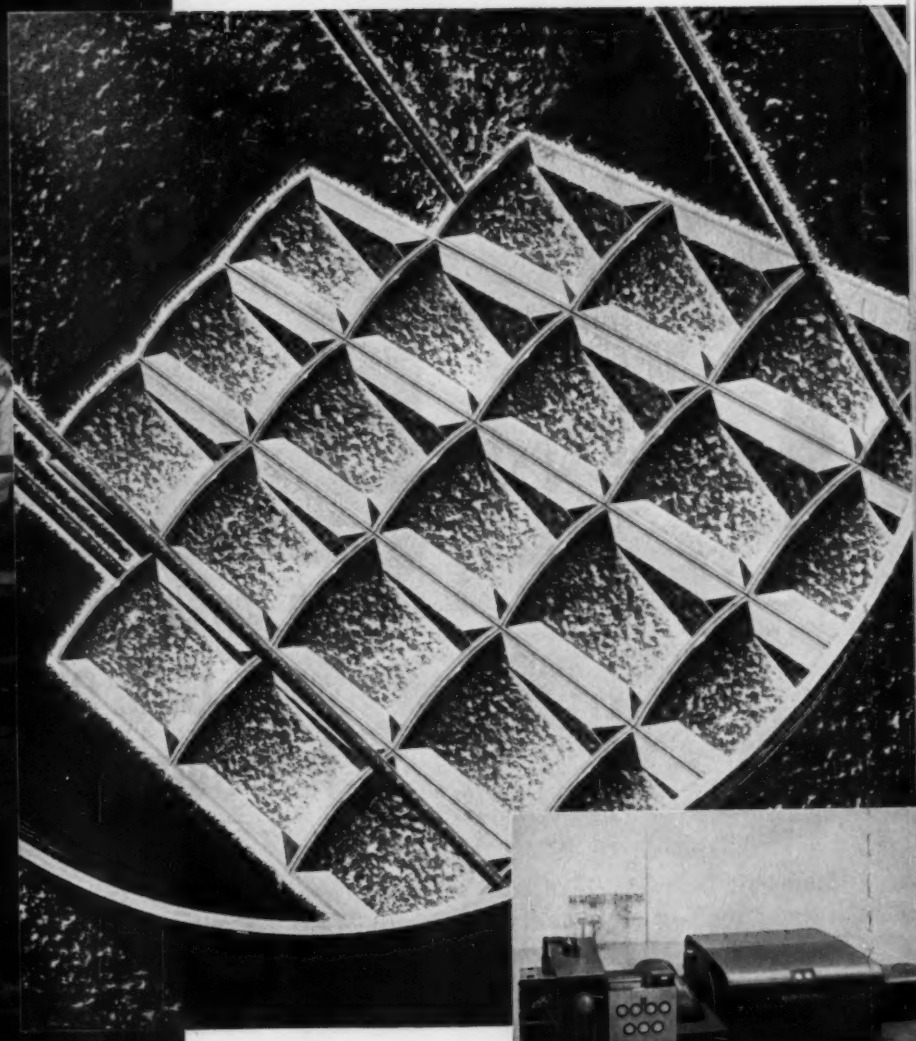
NUCLEAR





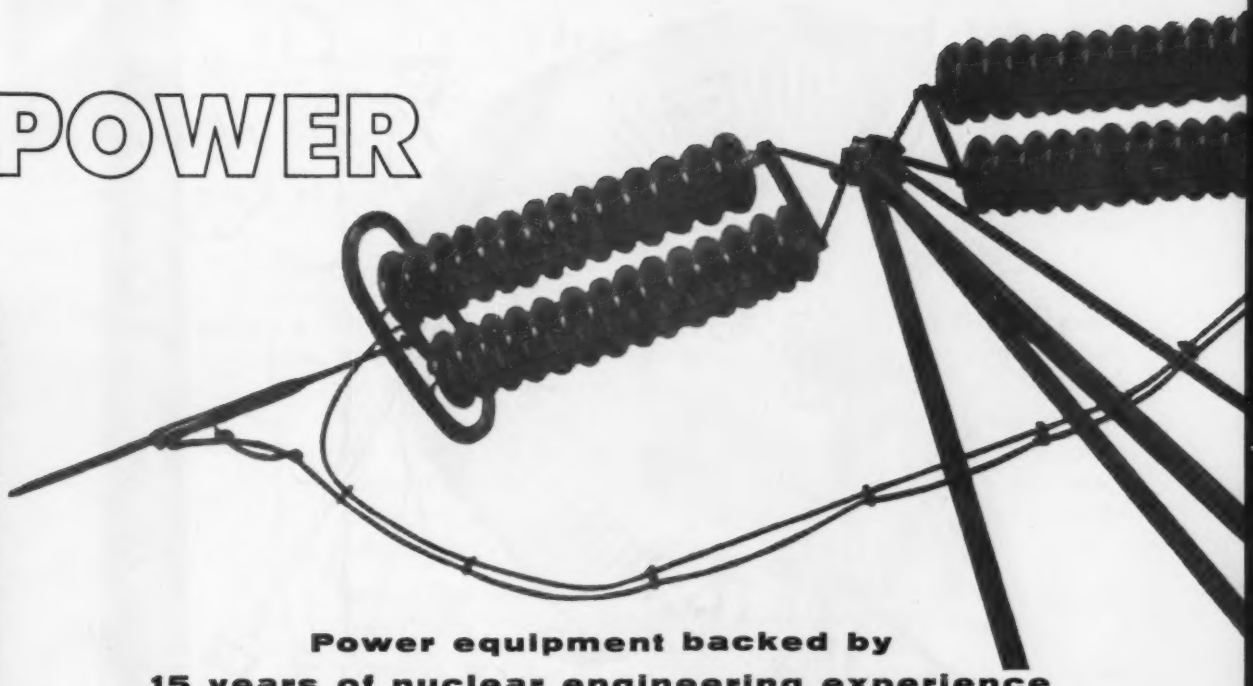
Reactors

Steam Turbine Generators

A-C
ALLIS-CHALMERS

A-5790

POWER



Power equipment backed by
15 years of nuclear engineering experience

ALLIS-CHALMERS development of nuclear reactors and allied equipment is a logical outgrowth of 75 years of building basic power equipment.

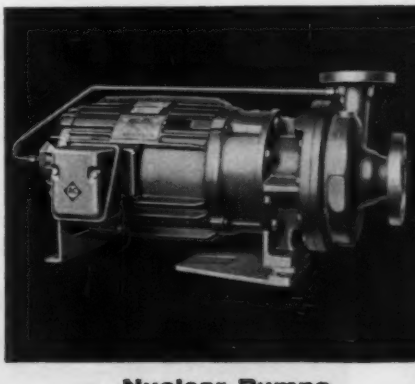
With nuclear experience dating back to the Manhattan Project, facilities, engineering, and production skills are being utilized to produce nuclear power equipment with the same high standards that identify A-C steam turbine generators, condensers, pumps, water conditioning equipment, control, switchgear, breakers, and transformers.

Allis-Chalmers is now engaged in the design and will construct a 66,000-kilowatt nuclear power plant* for the Northern States Power Company in cooperation with ten other electric companies.

Equipment and engineering for all nuclear power plant needs...

Condensers

Control and Switchgear



Nuclear Pumps

ALLIS-CHALMERS

*A model of a nuclear power plant using a Controlled Recirculation Boiling Reactor with nuclear superheater will be featured in the Allis-Chalmers exhibit in the United States Exhibition Area, Geneva Atoms for Peace Exhibition.

Power Boost with **PARANITE®**

Consolidated Edison is meeting the challenge of mounting demands for electrical power with a systematic program of replacement and expansion. Selected to help carry this ever-increasing load in the Metropolitan New York area is Paranite "Network Power Cable" . . . one of the many Paranite products which backs up a reputation . . . "IF IT'S PARANITE IT'S RIGHT®"

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The Electrical Week

FUTURE NEWS ▶ **Will "accelerated depreciation" get the congressional axe?** Look for a bill to be introduced to kill this benefit for electric and gas utilities in next session.

LATE NEWS ▶ **Commonwealth Ed is making a "real departure" in dividend policy** by paying out nearly all profits in cash and stock. Company will pay 50¢ a share quarterly in cash. "Our objectives," says Chairman Willis Gale, "will be to issue stock each year for approximately the full amount of the company's earnings on the common stock in excess of the base cash dividends." Market effect: On Sept. 3, stock opened on the big board with 6,000 shares at 52¼, up 3-⅜ from the previous day's close.

Formal commercial operation of St. Lawrence Power Project was commemorated in ceremonies at Massena, N. Y., on Sept. 5.

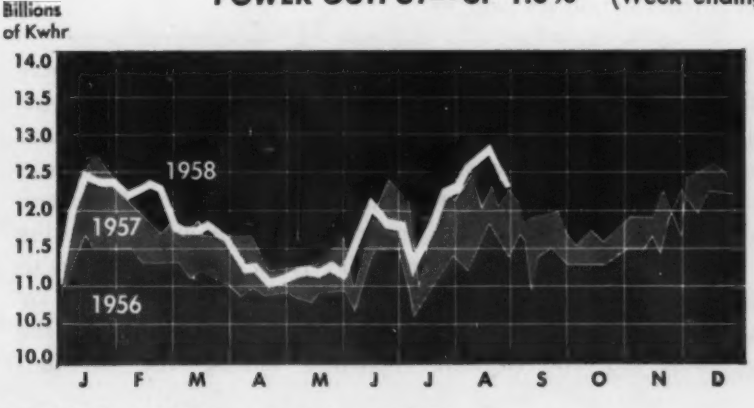
California PUC begins first hearings on accelerated depreciation on Sept. 24.

Southwestern Gas & Electric changes its name to Southwestern Electric Power Co, effective Oct. 1.

Labor notes . . . General Electric offers a "savings and security" program to about 100 unions. The plan, offered under reopener provisions on "employment security matters" in five-year contracts which run through 1960, would re-commit part of two 3.5% wage hikes slated for Sept. '58 and Sept. '59. GE believes these pay increases, agreed to three years ago, are unsound in today's economic climate.

Management changes . . . H. G. Lasselle becomes vp and general purchasing agent for New England Electric System, succeeding R. E. Shillady, retired . . . Worthington Corp elects A. E. Carter as vp, manufacturing.

POWER OUTPUT—UP 1.0% (Week ending Aug. 30), Kwhr 12,272,000,000



Per Cent Change From Previous Year

	Aug 16	Aug 23	Aug 30
Total U.S.	+3.6	+3.9	+1.0
New Eng.	+5.3	+4.3	+4.9
Mid. Atlantic ..	+7.0	+4.1	+3.4
Cent. Ind.	+1.7	+1.1	−1.3
West Cent.	+3.4	+6.2	−0.6
Southeast	+3.6	+6.8	+2.3
South Cent.	+7.9	+11.0	−1.0
Rocky Mount...	+6.2	+5.7	+7.8
Pacific			
NW	−8.8	−9.0	−8.3
SW	+4.6	+2.2	+6.1

Seasonally Adjusted Index 228.6

Week Ago 233.9 Year Ago 226.7

Source: Edison Electric Institute

EVENTS ▶ **First report on tour of Russian power facilities** was furnished by Detroit Edison Pres Walker Cisler, as he arrived in Geneva with his delegation of electric industry executives after 16 days behind the Iron Curtain. The trip was "very worthwhile," he told McGraw-Hill newsmen. The American group was especially impressed by Soviet pre-assembly techniques and the use of pre-cast concrete in power plant construction. The group saw Russian hydro-projects, nuclear plants and transmission facilities. They were well received wherever they went. For Cisler's more detailed impressions, turn to **page 56.**

A long-time downtrend in electrified transit is continuing, in spite of increased interest in mass transportation as cities get more crowded with cars. Diesel and gasoline buses have seriously damaged the trolley business, but electrified rapid transit still has its adherents. See transit roundup **(p 61).**

ATOMIC ▶ **Are power reactors safe?** Likelihood of a reactor explosion on the scale of a nuclear detonation is very small, according to AEC's reactor safety branch. During 15 years of reactor operations, there have been no harmful accidents involving a regular operating reactor. And this record of safety is no accident: reactor design stresses features that minimize the possibility of a runaway. Inherant safety features are backed up by control, instruments and mechanisms. But should a nuclear incident occur, the reactor pressure vessel and the building housing are designed to help contain its effects **(p 62).**

GENERATION ▶ **A new synthetic has replaced rubber in water turbine bearings.** Up to $3,000 may be saved in a single relining operation, says Shawinigan W&P **(p 74)** . . . Indiana-Kentucky is saving more than $100 per replacement by using seal inserts in worn shafts **(p 76).**

DISTRIBUTION ▶ **Transformer standards help meet new loads.** As utilities prepare for future growth, standardization implements volume production of medium transformers. Both supplier and user must work as a team toward improving today's standard and the industry's ability to use it. For further details see **page 88.**

SYSTEM ENGINEERING ▶ **How do you record your system interruptions?** Here's how Commonwealth Edison does it. After mergers with several companies, CE developed a uniform IBM recording of system interruptions throughout its seven divisions. These are the advantages, as CE sees them: (1) Reports are issued faster than under a "manual" system; (2) About $7,500 a year is saved in preparation time; (3) By using IBM equipment, one eight-hour man-day is all that is required to prepare a complete summary of interruptions for a year; (4) A breakdown of an interruption by feeder, circuits, etc, may be had for the asking; and (5) Interruption reporting among the divisions

becomes standardized, and can be done rapidly and accurately (p 62).

COMMUNICATIONS ▶ **Central Illinois PS is eliminating radio interference** by using a two-channel system, which employs a tone-coded squelch principle to take care of skip and local interference (p 74).

SAFETY ▶ **Centralized outdoor location of hydrogen and CO_2 bottles** with common supply headers serving all generators has been a standard safety feature of Southwestern Public Service since 1950 (p 76).

MANAGEMENT ▶ **Purchasing men, key people in utility anti-inflation plans,** have their work cut out for them as the recession recovery picks up momentum. Despite expectations of price increases on some items, buyers won't be speculating, according to an Electrical World sampling of utility opinion. Inventories are down from last year in most instances, and none of those surveyed plan any general build-up in stocks. The business upturn is bringing greater cost cutting concentration on such developments as value analysis, standardization and decentralized shipping (p 99).

INDUSTRIAL ▶ **Evans Chemetics, Inc, Waterloo, N. Y. has put in new lighting** (120 ft-candles) in its offices and drafting room to cut errors and improve work . . . An electric hotplate has solved a temperature control problem for a St. Louis engineering firm (p 84) . . . Need to know the heater size to keep a tank of viscous liquid at a given temperature? Try using the nomograph on page 78.

SELLING ▶ **Kansas G&E is pushing electric water heater sales** by making the lowest of ten special sales contest divisions take care of a goose named "Gertie" for a month . . . Chicago's famous State Street will soon have the brightest lighting in the world (p 83).

MANUFACTURERS ▶ **General Electric planning to spend $47 million** to modernize its transformer plant at Pittsfield, Mass . . . Faster pickling of copper rod resulting from new Rome Cable process . . . Reynolds Metals Co dedicating $11.5 million office building at Richmond, Va. (p 88).

NEW EQUIPMENT ▶ **H-frame spreader bar can set variety of structures,** complete with insulators and stringing sheaves . . . Compression connectors can be used with Cu or Al transformer primary and secondary connections . . . Kit can increase current rating of high voltage tilting air switches without removing switch from mounting . . . Outdoor housings for metalclad switchgear have labyrinth seals and neoprene gaskets on front and rear doors for double weatherproofing (p 92).

PEOPLE ▶ **R. J. Foreman new deputy administrator of REA** . . . J. T. Romano elected vp of Federal Pacific Electric Co . . . Kaiser Aluminum & Chemicals ups J. Ferguson, G. Houck and R. Harrison (p 107).

Blending the theoretical and the practical in the field of management organization is the subject of a recently published book entitled, **"Management and Organization".** The book is based in part on a study conducted by the National Industrial Conference Board of 168 expertly managed companies. Several utility companies are included in this study that shows the most effective way to decentralize organization for good staff and line structures, the process of delegating, and many other topics of interest to executives. The book also analyzes the trend to divisionalization and decentralization.— **Management and Organization. By L. A. Allen. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 353 pages. Price $7.00.**

TECHNICAL NOTES

Mixing together nuclear fuel and its moderator provides a prompt self-regulating mechanism for reactor control purposes because there is no time delay between fuel and moderator heating.

Effect of moisture content on soil thermal conductivity is more important in silt and clay soils than in sandy ones.

Although galloping of ice-coated overhead line conductors usually occurs in a gusty wind, it is possible in a light drift wind when the ground slopes at right angles to the line.

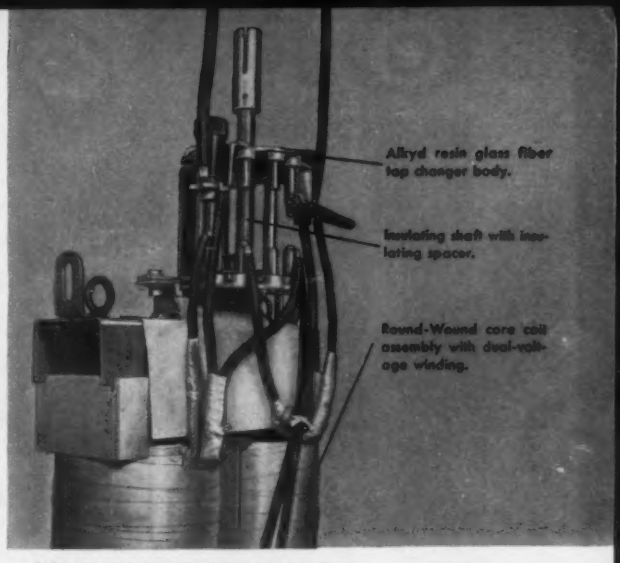
Impregnation with zinc naphthenate retards rotting of the hessian tape sometimes used as the outer cover of large oil-pipe type cables.

FROM EDITORS IN THE FIELD

Public Service Co of Colorado is studying feasibility of utilizing low-Btu gas for firing future steam plants near shale-oil processing facilities on Rocky Mountain western slopes. Early reports indicate sufficient 90-Btu per cu ft by-product gas may be generated by a 50,000-bbl per day oil unit to net 375 Mw after delivering 75 Mw to the oil plant facilities.

Mechanically correct, three-dimensional engineering and architectural drawings are possible under a drafting system developed by a Denver engineering concern.

COVER-MOUNTED series-multiple switch control for L-M dual-voltage transformers. The aluminum cap is simply unscrewed by hand and turned over to operate the switch. The oilproof and weatherproof seal is completely independent of the cap. Voltage is clearly indicated under the cap. (Arrow)


Alkyd resin glass fiber tap changer body.
Insulating shaft with insulating spacer.
Round-Wound core coil assembly with dual-voltage winding.

L-M ROUND-WOUND dual-voltage core-coil assembly, showing the direct motion-transmission from the cover-mounted control through self-aligning stainless-steel shaft. The heavy-duty snap switch is built with the same time-proved components used in the trouble-free L-M tap changer.

L-M's Dual-Voltage Transformers Offer Cover-Mounted Switch, Round-Wound® Design

Cover-mounting provides direct control, better rigidity, with less danger of oil leakage and accidental damage. Round-Wound construction assures best possible performance.

By **DENNIS A. MANNING**
Manager, Transformer Sales & Service
Line Material Industries

L-M dual-voltage transformers offer some appreciable advantages to companies in the process of changing over to higher distribution voltages. When the change is definitely planned, L-M dual-voltage Round-Wounds make it possible to change the transformer from a lower voltage to a higher one simply by unscrewing the cap at the top and snapping the switch.

This reduces labor in cutting over; there is less down time, resulting in increased revenue to the utility and better service to the customer—certainly important advantages.

Some Disadvantages

In considering the installation of dual-voltage transformers, some disadvantages should be recognized. First, the cost of the units is higher than the cost of a standard transformer. Second, losses are at least those of the higher-voltage winding. If the transformer is to be operated at the lower voltage for a long time, these higher losses may be a factor worth considering.

However, where the change is contemplated within a reasonable length of time, reduced labor costs and elimination of down time may well be offsetting factors.

Many Advantages of Cover-Mounting

The cover-mounted L-M switch is an excellent feature. Vertical construction makes for excellent mechanical design. Motion is transmitted directly to the switch by a self-aligning shaft. This shaft is stainless steel, which prevents corrosion that could cause binding.

With the switch control in the cover, there is less danger of tampering, less danger of accidental damage, and less interference when mounting the transformer. The switch cap is more easily accessible to the lineman than a switch on the side of the tank.

Clear, Positive Indication

Only the voltage for which the switch is in position is seen on the top of the switch, so there is no possibility of confusion. For safety there are double stops, one internal, one external. It is not necessary to remove the tank cover to check switch position. Should the weatherproof cap be misplaced, no material damage will result, and switch is easily operated with a small wrench.

Let Us Supply Data, Details

L-M Round-Wound dual-rating transformers are available in various combinations from 2400 to 14,400 volts through 100 kva. Let us supply detailed information both on the design and on the ratings and sizes available. Ask the L-M Field Engineer—or if you prefer, write me at Line Material Industries, Transformer Division, Zanesville, Ohio.

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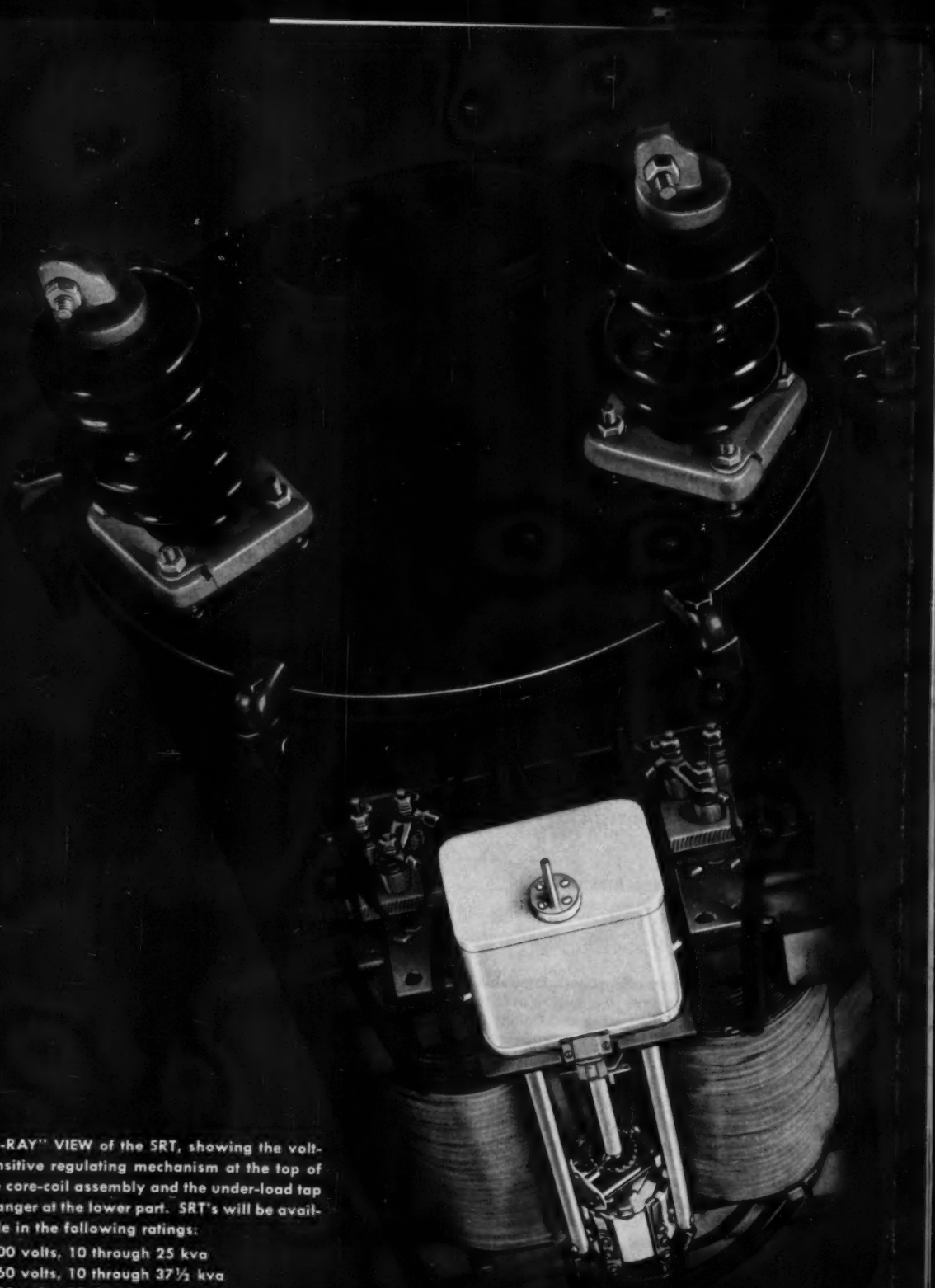
LINE MATERIAL Industries Distribution Transformers
McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON



"X-RAY" VIEW of the SRT, showing the volt-sensitive regulating mechanism at the top of the core-coil assembly and the under-load tap changer at the lower part. SRT's will be available in the following ratings:

2400 volts, 10 through 25 kva
4160 volts, 10 through 37½ kva
4800 volts, 10 through 50 kva
7200 and 7620 volts, 10 through 75 kva
12,000 and 14,400 volts, 10 through 100 kva

L-M Announces the

SRT

THE WORLD'S FIRST

Self-Regulating distribution Transformer

A Revolutionary New Engineering Development That Offers Utility Companies Better Revenue, Better Service To Their Customers

By **A. R. WAEHNER**
Director, Transformer Sales, Line Material Industries

The new L-M Self-Regulating Transformer consists of a Round-Wound® distribution transformer with extra taps on the *primary*, and a regulating mechanism that is volt-sensitive on the *secondary*.

The device switches primary taps, *under load*, to change the transformation ratio as needed to maintain a constant normal voltage to the customer, regardless of line or load changes. The SRT provides 10% of regulation in four 2½% steps.

Better Revenue For The Utility

The SRT is a break-through into a whole new world of customer service and profitable operation, because it corrects the voltage *at the point of use*. By maintaining proper voltage, the SRT prevents the drop in billings caused by *undervoltage*, which in the aggregate can represent a considerable loss.

Improves Service To Customers

With correct voltage, lights are brighter; television sets, clothes dryers, air conditioners, and other electrical devices operate more efficiently; ranges heat faster.

The SRT also prevents *over-voltage* from reaching the user. This greatly reduces burnouts of TV tubes, and of incandescent lamps—the latter a very obvious saving to a utility with a lamp-replacement program.

The SRT is another outstanding contribution of The Thomas A. Edison Laboratories of McGraw-Edison Company.

Features Of The SRT

Adapt-a-Tap Range Selector: The SRT provides a full 20% range within which taps for the 10% automatic regulation in four 2½% steps may be selected—all below, straddle, or all above normal. Thus the SRT can be located anywhere on the line—the end, the middle, or near the substation.

Nominal 3½-Volt Band Width: The midpoint is set, for example, at 120 volts. The SRT changes taps whenever the voltage drops to 118¼ or rises to 121¾. Each operation occurs only after a time delay, which prevents undesirable operation and "hunting" on switching surges and momentary variations outside the band width.

Reliability: One 2400-volt tap changer has now operated more than 250,000 times—equivalent to over 40 years' life on a 25 kva transformer.

Economy: Under normal conditions the SRT will prove more economical than other means of voltage correction. Thus it opens unlimited horizons to the distribution-system planning engineer for more effective design.

Available For Tests

The initial production of the SRT will be sold to progressive companies to explore the benefits, in improved revenue and better customer service, that are available from this outstanding new development. Thus each company can learn, for itself, the extent to which the SRT can make a substantial contribution toward keeping revenue up and costs down.

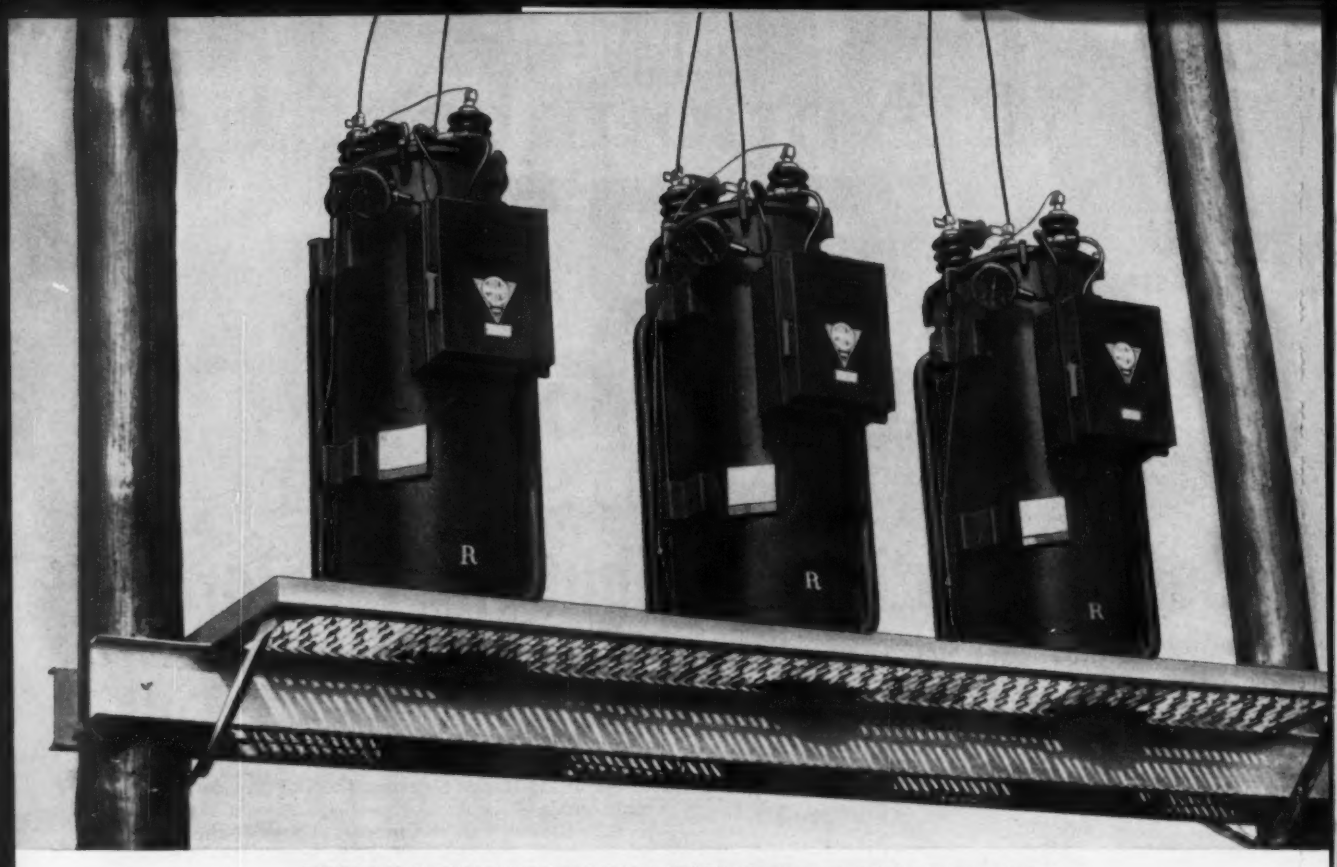
Get The Details

L-M Field Engineers and Apparatus Specialists can furnish detailed information about the SRT. If you would like this information, please get in touch with your L-M Field Engineer, or phone or wire me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Distribution Transformers

McGRAW EDISON

350



THREE L-M 7620 VOLT 32-STEP REGULATORS, platform mounted, are in a circuit serving cotton gins and other customers where accurate regulation is a necessity.

6 Reasons More and More Utilities Are Selecting L-M Step Regulators

Pole-space saving, obround tank with less bending moment, cover suspension, tap changer, easily adjusted accurate control, and Add-Amp feature are some of the reasons why utilities throughout the country are selecting L-M regulators.

The L-M 32-step regulator includes the desirable features of all distribution-type regulators in one complete unit. Several of these features are:

1 The L-M regulator, because of its short height, takes less pole space.

2 The obround tank makes L-M regulators lighter, more compact. They hug the pole, which results in lower bending moment.

3 Cover suspension of the entire internal assembly facilitates inspection and maintenance.

4 The unusually rugged tap changer, with hydraulic speed control for optimum contact life, provides regulation in smooth ⅝% steps.

5 The L-M Add-Amp feature gives increased load-carrying ability where less than ±10% range of regulation is satisfactory.

6 The control, with induction disc type contact-making voltmeter and Class I accuracy, has simple adjustments for voltage level, band width and line drop compensation. Taps can be changed on ratio correcting transformer in control cabinet, for reduced voltage operation, *without* untanking of regulator.

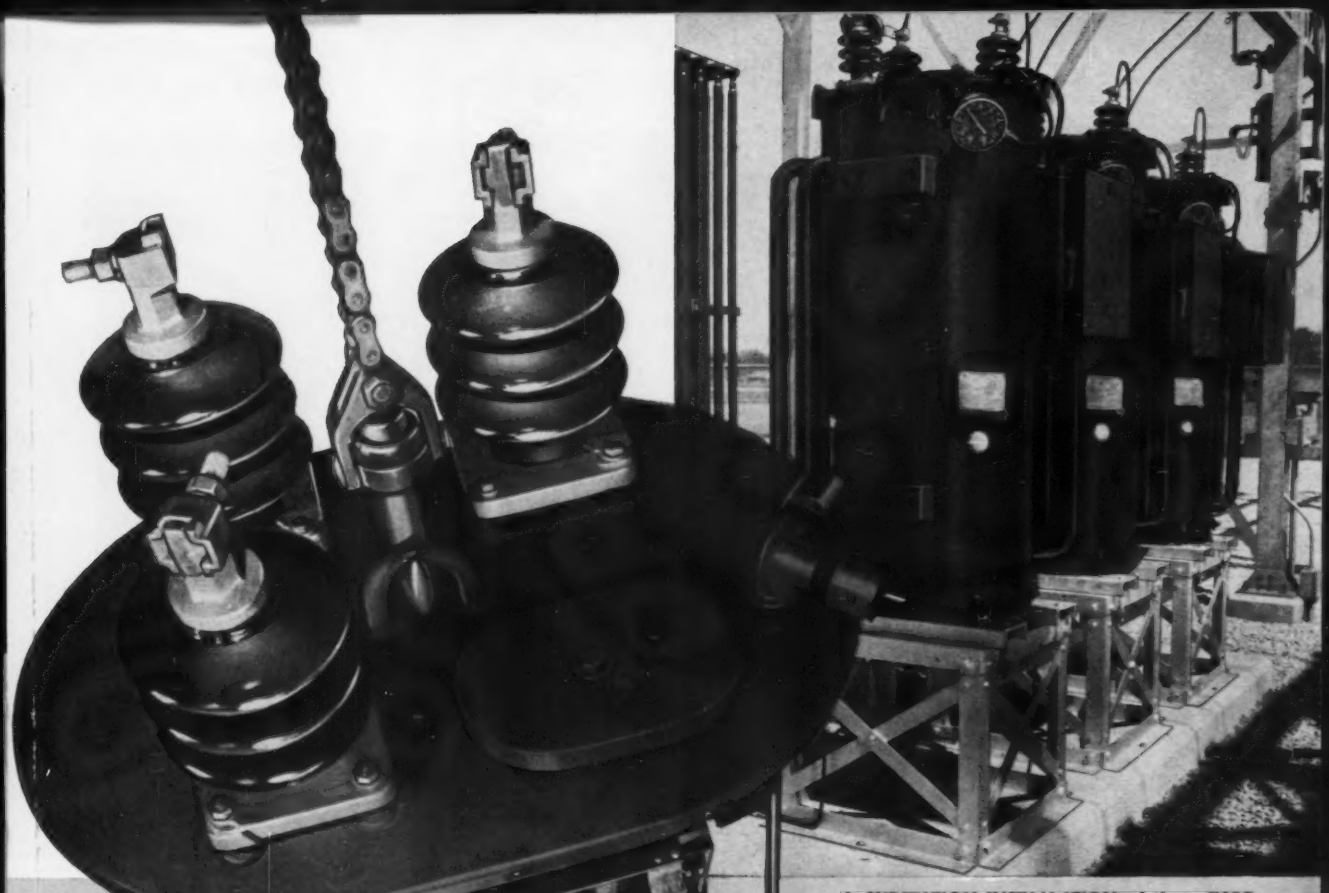
Many other features combine to make this a most desirable regulator, which many utility men consider superior to anything else on the market. No other regulator offers so many advantages in one single unit.

Ask the L-M Field Engineer About It

The L-M Field Engineer can provide complete information and bulletin on the application and design of L-M regulators. Or write for bulletin to Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY



A SUBSTATION INSTALLATION of three 7620 volt regulators. L-M regulators are presently available in these ratings: 2.5 kv, 100, 150, 200 amps; 5 kv, 50, 100, 150, 200 amps; 7.62 kv, 25, 50, 75, 100, 150 amps.

THE COMPLETE INTERNAL ASSEMBLY is cover-suspended to simplify untanking. This desirable feature permits quick, easy inspection of all mechanical and electrical parts, without dismantling the unit or draining the oil.

THE L-M REGULATOR is light, small, compact. This and the obround tank make the L-M regulator very desirable for pole mounting, because of the reduced bending moment on the pole. The L-M regulator is as much as 21 inches shorter than other regulators; thus it takes less pole space.

Regulators

McGRAW EDISON

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DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

Here's how Roebling VCV works!

1 Strand wrapped in semi-conducting tape goes up through 4-story, high-temperature tube. This drives out gases and moisture from core, and preheats the conductor for more uniform curing.

2 Conductor is put under controlled tension, which is maintained during entire insulating process.

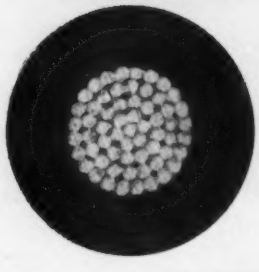
3 Butyl insulation is extruded downward around conductor.

4 Vulcanization takes place continuously and uniformly in vertical tube. Constant high steam pressure assures dense, sound insulation.

5 Insulation never touches anything until high-pressure water cooling is complete. The result is unvarying roundness, smoothness and concentricity of butyl insulation.

The Conductor is Always Dead Center

ROEBLING VCV



ROEBLING'S 15 KV CABLE HAS UNIFORMLY HIGH CORONA LEVEL AND DIELECTRIC STRENGTH. VERTICAL CONTINUOUS VULCANIZATION ASSURES UNUSUALLY LONG TROUBLE-FREE CABLE SERVICE.

If you sliced a length of Roebling's VCV 15 kv Cable into cross sections, you'd find that *every inch* is uniform, every inch is round, and in every inch the conductor is exactly centered!

VCV is responsible for the exceptional quality of this new high-voltage cable. No longer will you buy cables in which the conductor has "snaked," or that has flattened, scraped, blistered or abraided insulation. Because insulation is the same thickness and density for the length of the cable, dielectric strength and corona level are uniformly high.

ROEBLING VCV 15 kv CABLES are available in a complete range of conductor sizes and insulation thicknesses

Write today for more facts about the longer, better service you'll get with Roebling VCV High-Voltage Cable. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

New Convenience and Control in Communications for Utilities . . .

RCA Mobile Radio with PERSONALFONE!

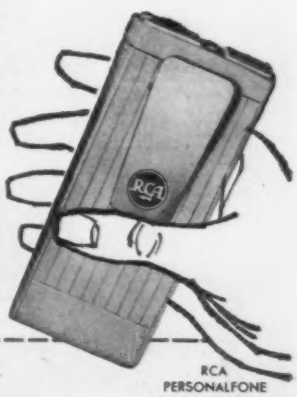
Here's the way to gain top efficiency in handling your trucks and your men: use dependable RCA 2-Way "Carfone" Radio in mobile equipment, and RCA Personalfone "Belt" Radio on linemen or construction workers *away from vehicles* . . . for instant contact on the job!

RCA "Carfone" Radio is available for all frequencies and assures quality that only the leader in radio and electronics can offer . . . split or wide channel equipment, featuring new "Minitrol" combination microphone-control-speaker efficiency for desk stations, "Red-Head" clear-talking mobile microphone.

New RCA Transistorized "Personalfone" miniature Radio provides two-way service, mounts in two pouches on lineman's belt, has excellent selectivity and stability.

Advanced engineering means greatest satisfaction, lowest maintenance. Expert service by RCA's own Communications technicians.

Find out about this modern communications equipment today! Use coupon.



RCA PERSONALFONE FM "BELT" RADIO

Trnk(s) ®

RADIO CORPORATION of AMERICA

COMMUNICATIONS PRODUCTS

CAMDEN, N.J.

Radio Corporation of America
Communications Products
Dept. K45, Building 15-1, Camden, N.J.
In Canada: RCA VICTOR Company Limited, Montreal

☐ **Please send me FREE booklets on RCA Communications Equipment for use in the Utilities.**

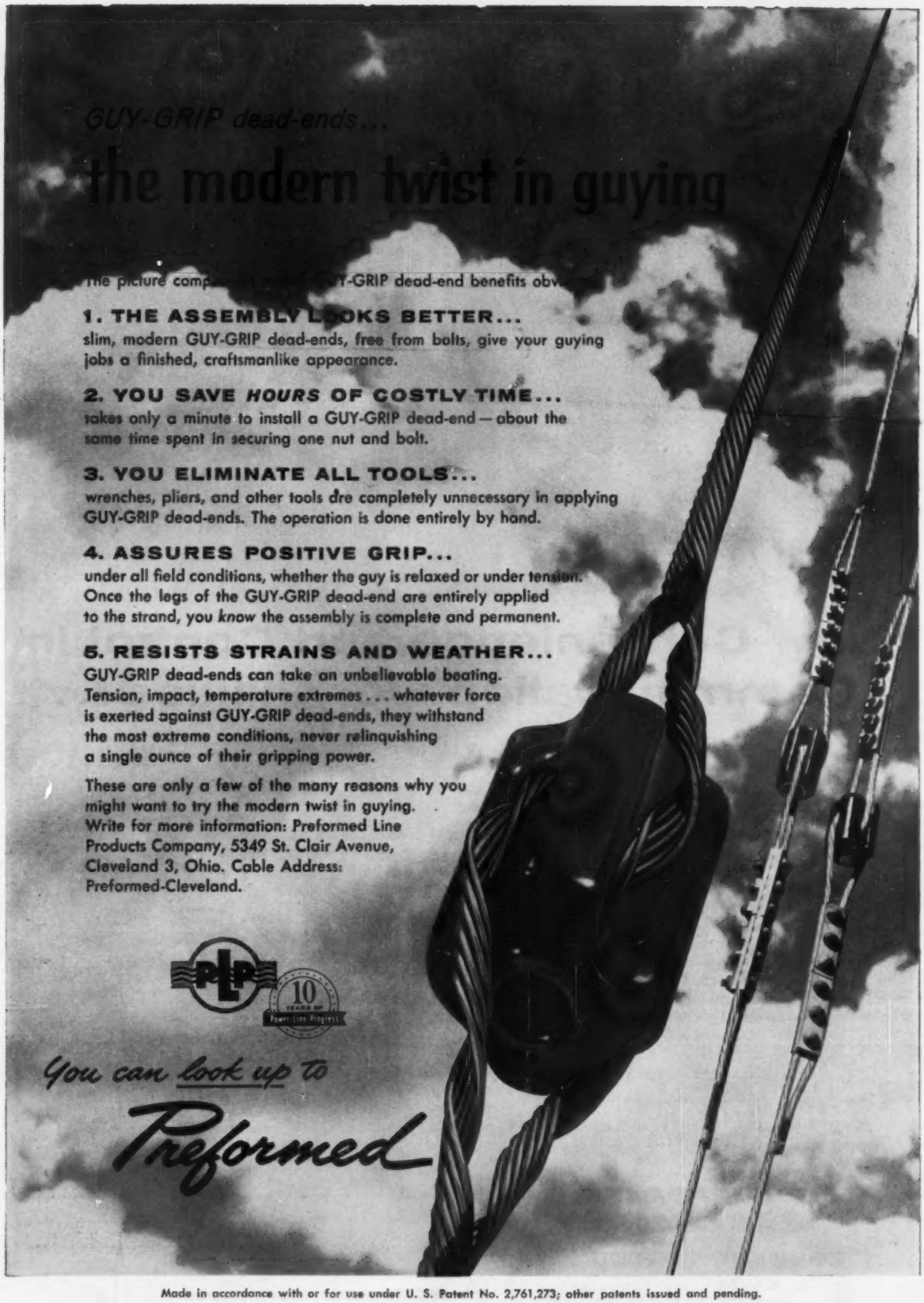
NAME _____ TITLE _____
PLEASE PRINT

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

☐ **Have RCA Communications Specialist contact me.**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the modern twist in guying
The picture comp... Y-GRIP dead-end benefits obv...
1. THE ASSEMBLY LOOKS BETTER...
slim, modern GUY-GRIP dead-ends, free from bolts, give your guying jobs a finished, craftsmanlike appearance.
2. YOU SAVE HOURS OF COSTLY TIME...
takes only a minute to install a GUY-GRIP dead-end — about the same time spent in securing one nut and bolt.
3. YOU ELIMINATE ALL TOOLS...
wrenches, pliers, and other tools are completely unnecessary in applying GUY-GRIP dead-ends. The operation is done entirely by hand.
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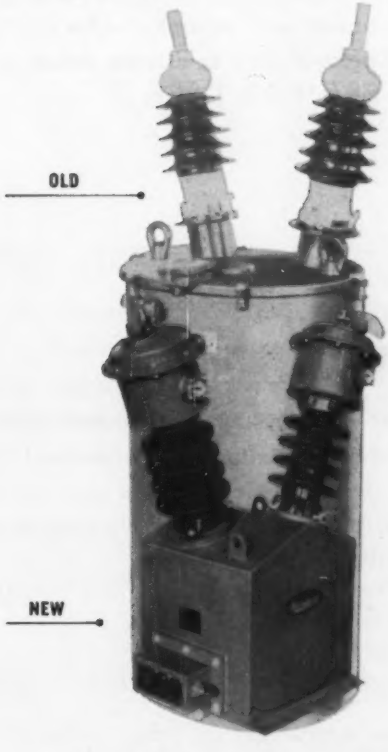
under all field conditions, whether the guy is relaxed or under tension. Once the legs of the GUY-GRIP dead-end are entirely applied to the strand, you know the assembly is complete and permanent.
5. RESISTS STRAINS AND WEATHER...
GUY-GRIP dead-ends can take an unbelievable beating. Tension, impact, temperature extremes . . . whatever force is exerted against GUY-GRIP dead-ends, they withstand the most extreme conditions, never relinquishing a single ounce of their gripping power.
These are only a few of the many reasons why you might want to try the modern twist in guying. Write for more information: Preformed Line Products Company, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland.
PLP
10 YEARS OF Power Line Progress
You can look up to
Preformed

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.

OUTDOOR METERING TRANSFORMERS...

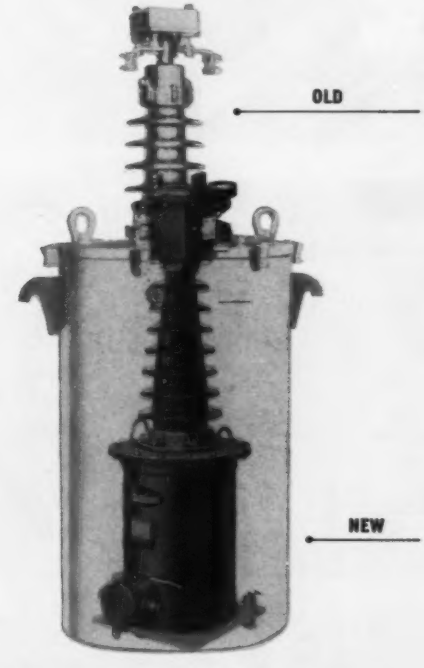
...accuracies within 0.3% at all ASA standard burdens

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. The new line conforms to all ASA, EEI and NEMA mounting and accuracy standards. These transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard Representative or write directly to us. You'll increase your accuracy where it counts most—ahead of and at the meter.



TYPE PXO OISC POTENTIAL TRANSFORMER

—outdoor type. Up to 69,000 volts primary; 120 volts secondary and secondary terminal box. Also available with single bushing for line to ground connection.



TYPE CWO OISC CURRENT TRANSFORMER

—outdoor type. Up to 69,000 volts; and up to 400/800 to 5 amperes. With oil level indicator, primary bypass protector, and secondary terminal box.

LIVE BETTER ELECTRICALLY

Phone 2-1563

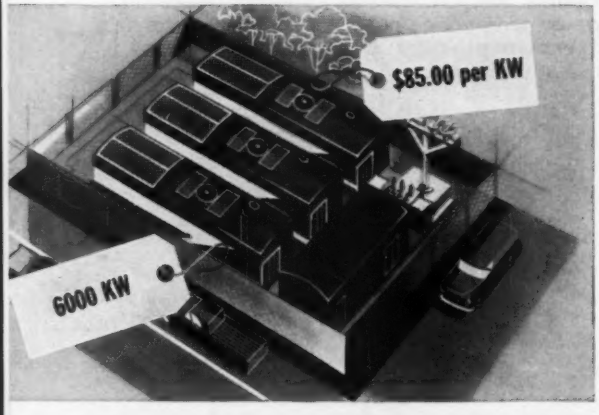
Standard Transformer CO.

WARREN, OHIO

"WHEREVER THERE IS POWER"

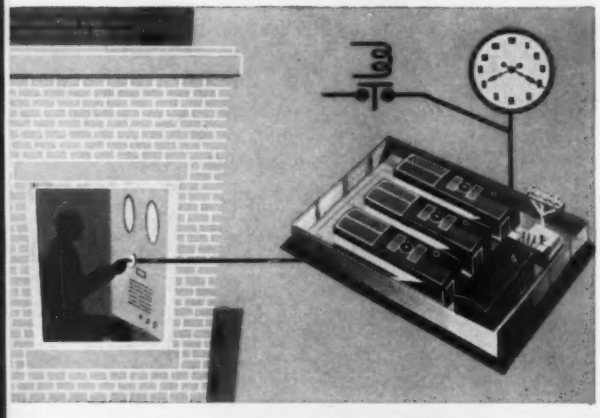
Electro-Motive 6000 KW

Product facts for your peaking plans—



6000 KW at $85.00 per KW*

To perform economically its intended function, peaking equipment must naturally be low in original cost. Electro-Motive equipment meets this cost requirement. *F.O.B. Factory.



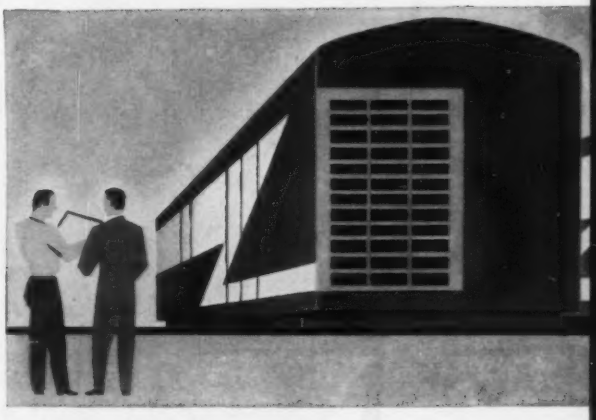
Unattended operation

The 6000 KW Peaking and Reserve Plant operates completely unattended. An electrical impulse is all that is needed—from a time clock, dispatcher, current or voltage sensing equipment or a combination of these methods.

Readily transportable

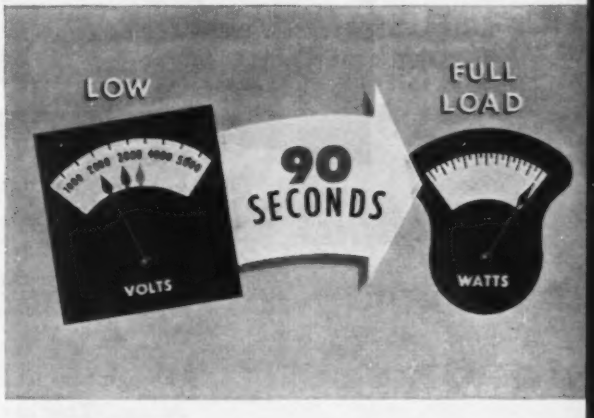
The Electro-Motive Peaking and Reserve Plant is handled much the same way as many transformers. Components are shipped on standard rail cars or highway equipment.

Peaking and Reserve Plant



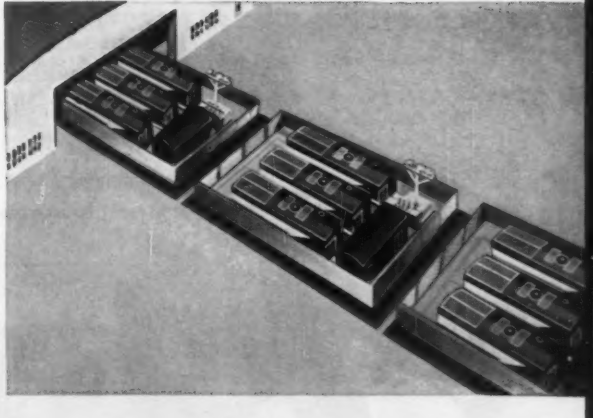
Quiet operation

Silencing arrangements are included to fit the varying conditions under which Electro-Motive Power must operate. Thus considerable freedom can be exercised in location of the equipment.



Quick start

The Electro-Motive Peaking and Reserve Plant starts instantaneously. In a matter of seconds it is on the line at full rating, thus fulfilling the requirement for spinning reserve.

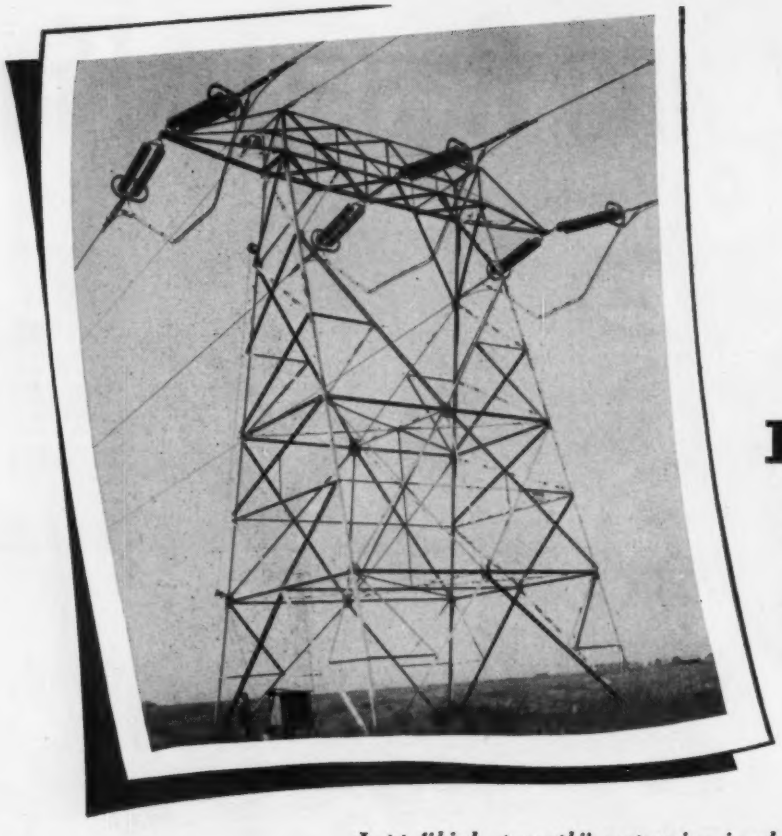


One manufacturer

Electro-Motive Peaking Plants are designed, engineered, manufactured and serviced by Electro-Motive. There is only *one* manufacturing responsibility for the complete plant—starting from fuel input to power output.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS **Sales-engineering offices:** Chicago, New York, St. Louis, San Francisco *In Canada:* **General Motors Diesel Limited,** London, Ontario



In 1923 this was EHV

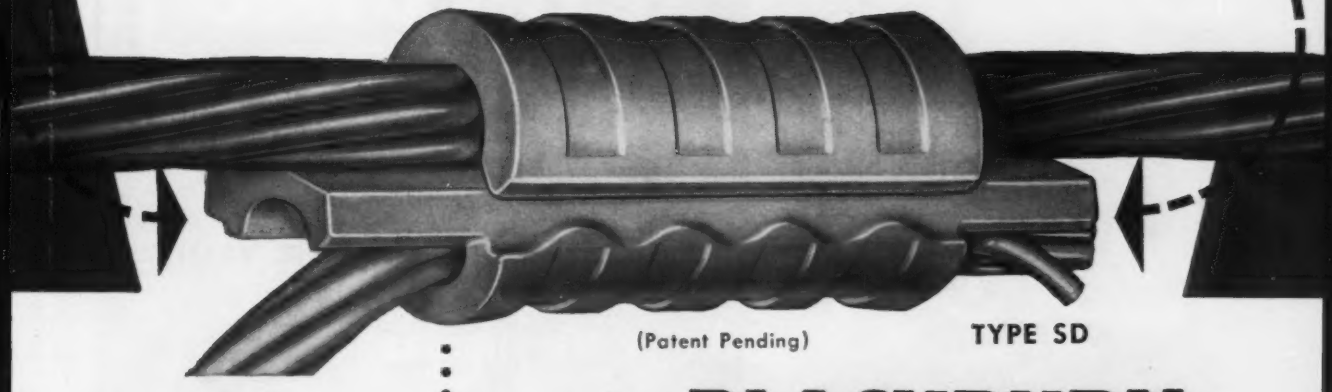
Lapp "high strength" suspension insulators were used by Southern California Edison Co. for its 220 kv Eagle Bell line. Erected in 1923, this line is now in its 35th year of service. Original insulators are still in place. Company reports "no trouble"; total replacement of insulators for all causes over 34 years is "less than 1%."

"Design for electrical security and long life—then do all you can to make it strong." This has been a Lapp principle from the beginning. In 1923, when the line shown above was erected, the insulators on it were cataloged as 18,000-lb. units—at a time when the industry was talking generally of 9,000-lb. and 12,000-lb. units. Before, and since then, Lapp has pioneered in insulators that combine long life with high mechanical strength.

For your EHV and other high-mechanical-loading requirements, specify the current Lapp 25,000-lb. suspension units; another generation of operating people in your company will be proud of the service records they set.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Exclusive New DRIP-GUARD SEPARATOR



(Patent Pending) TYPE SD

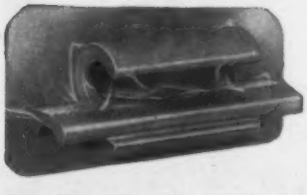
in BLACKBURN 6-Frame Tap Connector

- **Assures Separation of Conductors**
- **Provides Needed *Extra* Protection on Bi-Metallic Connections**

Type SF Recommended for Aluminum to Aluminum

This Blackburn 6-Frame Tap Connector assures complete separation and protection of the conductors. The Drip-Guard is unnecessary for this application.

Both Designs Available *Pre-Filled*

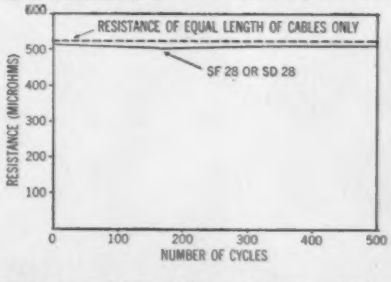


Type SD or SF may be ordered pre-filled with Blackburn's superior oxide-inhibiting compound, Contax. Pre-filling eliminates the possibility of an installation being completed without inhibitor.

Write for samples

LIVE BETTER ELECTRICALLY

CURRENT CYCLING TEST TELLS THE STORY



Current Cycling Test Conditions:

1. Cables: 4 Stranded Copper; 2 ACSR.
2. Cable operating temperature: 125° C.
3. Cycle: 2 hours "On", 1 hour "Off".
4. Length of connection: 24 inches.
5. Resistance of equivalent length of wire: 522 microhms.
6. Cables were wire-brushed, but no protective compound was used.
7. Curves represent an average of seven tests.

This rugged Blackburn design provides protection for conductors from both galvanic corrosion and physical damage. The Blackburn Drip-Guard Separator, plus the completely enclosed tap, prevents corrosion products from bridging the gap between the copper and aluminum conductors. Copper wire now can be used as main or tap without corrosion damage to the aluminum conductor.

In addition, the superior Blackburn design, which incorporates external channels parallel to the tap hole, assures uniform encirclement of both conductors when compressed.

Shot-blasted surfaces protected by an oxide-inhibiting film insure oxide-free connectors at jobsite.

for easy handling

AWG 14-6 in cartons
AWG 4-2 in wrapped coils
AWG 1-1,000,000CM on reels

Southwire

BUILDING WIRE

type TW
full range of sizes
standard colors
UL approved

Southwire type TW building wire is conveniently packaged for easy warehousing and installation—Underwriter Laboratory approved and suitable for general use in conduit, raceways or on insulators. All Southwire TW is oil, moisture and flame resistant and approved for wet location installations. Smaller sizes are prelubricated for ease of pulling in conduit.

Order Southwire TW and get Southwire service automatically—rapid delivery via our own trucks from the most complete mill warehouse stock in the South.

SOUTHWIRE PRODUCTS

- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene Weatherproof Copper, Aluminum and Triplex
- Polyethylene Weatherproof Copper, Aluminum and Triplex
- Southwire Vinyl Weatherproof Copper, Aluminum and Triplex
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories

"SOUTHWIRE MEANS SERVICE"

Southwire Company

TErrace 2-6311 CARROLLTON, GEORGIA

Will that Extra Unit Ever Cost So Little Again?

IF YOU'RE GOING TO NEED EXTRA INSULATION—EVER— NOW IS THE TIME TO PUT IT IN

Remember after World War II when $10,000 seemed like a big price for a five-room house? That's the house that will cost $20,000 today.

During the same period, the price of a primary deadend insulator has increased, too. But the cost of the insulator is only a fraction of the cost of putting it in the air. Changing a deadend from one to two insulators, or from two to three, costs much more than the insulator. And certainly, it will cost even more ten years from now.

Nearly everyone is restudying future distribution voltage requirements, and deciding now which distribution deadend will provide adequate insulation for tomorrow's voltages. They know system voltages are going higher, much higher.

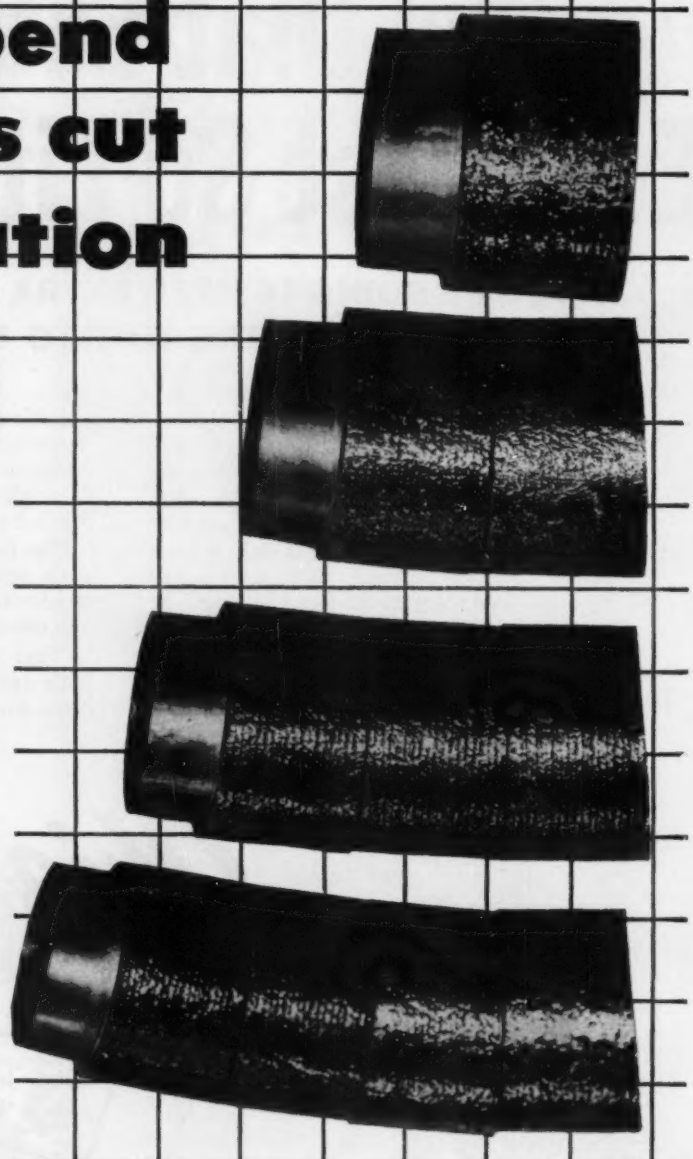
The point is plain. If you're ever going to need extra insulation in your distribution deadends, now is the time to install it . . . as you rebuild existing lines and build new ones.

That extra insulator will never cost so little again!

OHIO BRASS COMPANY, MANSFIELD, OHIO

4868-H

These bend sections cut installation costs



Orangeburg 5° Bend Sections are the "on-the-job" answer to special bend problems. They get over, under or around those unforeseen obstructions . . . and do it easily and economically.

Crossovers . . . transformations . . . offsets . . . can be made in the field by joining sections together to obtain the desired direction change. No costly delays . . . no special bends needed.

Orangeburg 5° Bend Sections* are another reason why Orangeburg Fibre Conduit is the ideal protective raceway for underground electrical cables.

Distributed by Graybar Electric Company and General Electric Supply Company. Branches and stocks in principal cities.

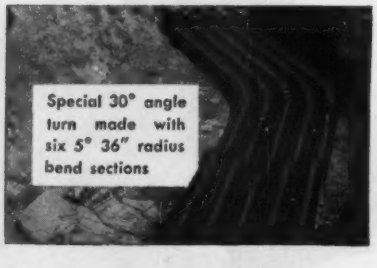
Write Dept. EW-98 for Bulletin S.E.C.

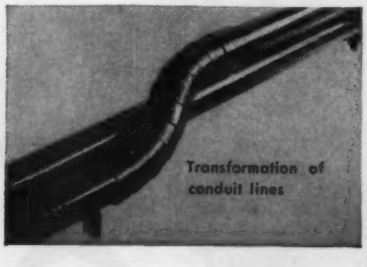
**Made for Orangeburg Standard Conduit only.*

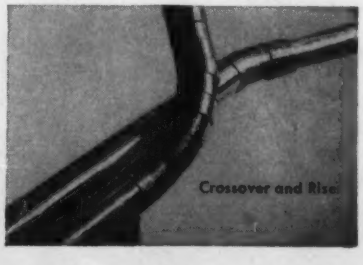
ORANGEBURG MANUFACTURING CO., INC.
Orangeburg, N. Y. Newark, Calif.

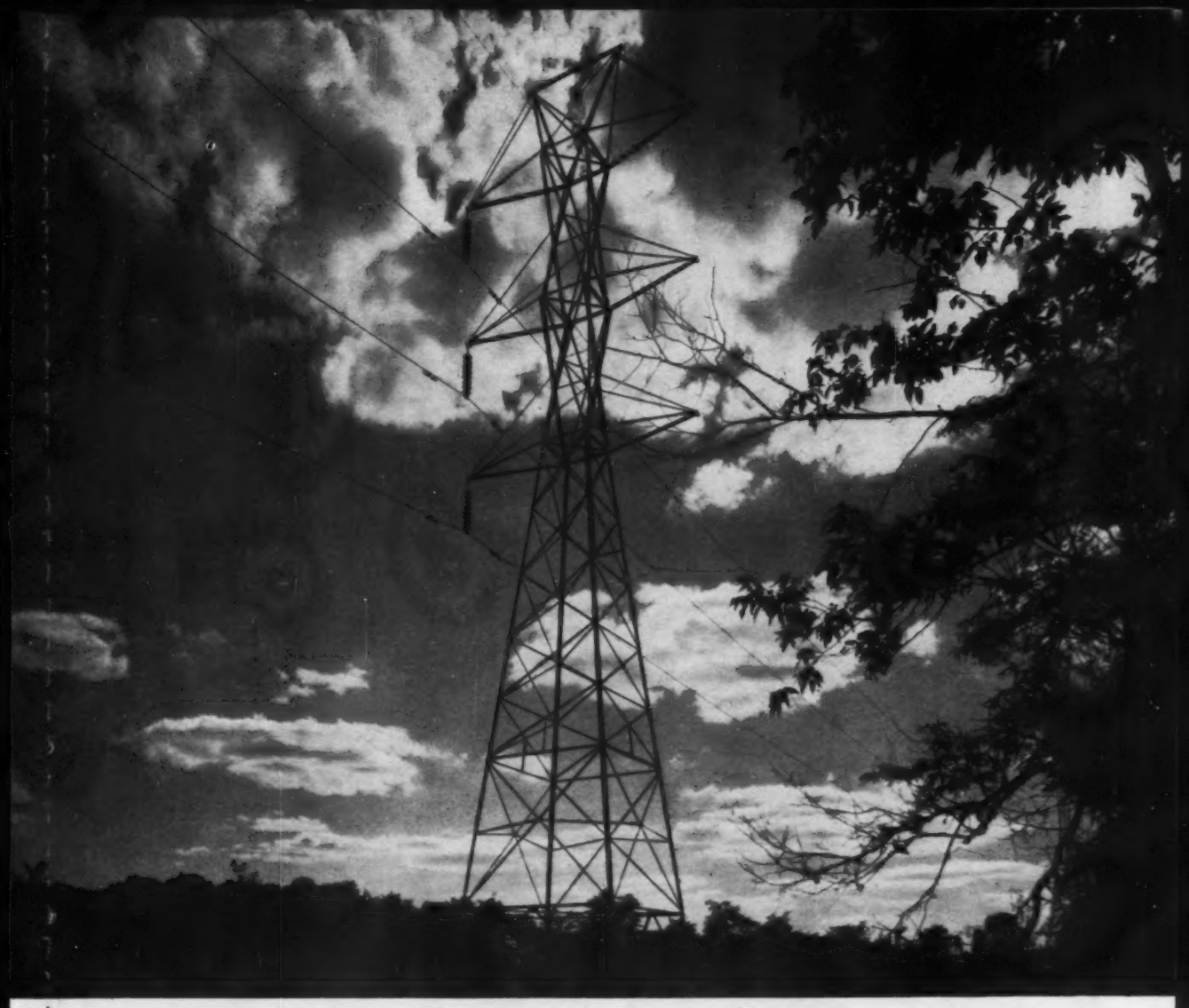
ORANGEBURG®

FIBRE CONDUIT PROLONGS CABLE LIFE









Blaw-Knox Double Circuit Tower — first circuit installed; built-in provision for second circuit when needed

To expand an existing line . . . to build a new line . . .

they chose BLAW-KNOX TOWERS

To feed the output of a new unit at the Picway Generating Station into their 138 kv system and to meet the demand in a growing residential area, Columbus and Southern Ohio Electric Company approved construction of two new transmission lines. For both lines, they chose Blaw-Knox towers.

The 138 kv line from the Picway Generating Station to Harrison Switching Station, a distance of one mile, required one 100′ single circuit tower and five double circuit towers varying from 50′ to 95′ in height.

The 10 mile, 138 kv line from Wilson Road to Bethel Road Substations is carried on 50 double circuit towers from 50′ to 85′ in height.

For more than 40 years, Blaw-Knox has worked closely with Electric Utilities in designing and fabricating towers for every type of transmission system. From this experience have evolved basic designs combining maximum structural advantages and ease of erection with unique allowances for custom modification. The performance record of Blaw-Knox Towers assures you . . .

- **towers custom designed to best meet your individual requirements**
- **high quality fabrication for easy field erection**

Send today for Folder 2509 . . . or tell us your needs, and we'll give you our recommendations and a quotation.

BLAW-KNOX COMPANY • **Blaw-Knox Equipment Division**
Pittsburgh 38, Pennsylvania

BLAW-KNOX

TRANSMISSION TOWERS—Steel Transmission towers, custom-built for each installation...multi-circuit and other special structures...and antenna towers, guyed and self-supporting types for AM • FM • TV • microwave • communications • radar

"Heads-up" wiring in Texas...

...as Crain Electric installs Rome's tough power cable at Amarillo's new Olsen Park school

For the long cable pull on this job—from transformer vault to the service connection on the pole—Crain Electric Company needed a tough, abrasion-resistant cable. That's one reason they installed Rome's Rozone-Roseal power cable.

Here are the other reasons why this rugged cable is ideal for almost every type of high-voltage installation—either underground or overhead:

Special polyethylene protection. Roseal is a special flame-retardant polyethylene developed by Rome Cable. It provides excellent resistance to abrasion, moisture, weathering, oils, and most chemicals; and it is considerably easier to pull than other cables. You can install Roseal-jacketed cable underground or overhead, in climates as distinctly different as Amarillo's and Duluth's, and still enjoy the benefits of long cable life.

Water and ozone-resistant insulation. A special oil-base insulation—Rozone—assures protection against ozone cutting and moisture. High dielectric and impulse strength makes it an outstanding choice for your high-voltage installations. And its unusual resistance to moisture permits you to bury this cable safely in areas where it must remain immersed in water for long periods of time.

Specify Rome's Rozone-Roseal for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 717, Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

UNDERGROUND OR OVERHEAD. Power cable leaves reels for underground installation to pole. It's also ideal for overhead use.

EASY TO PULL. This Crain Electric Company workman guides Rome's high-voltage power cable into conduit at the start of a 250-foot pull from Amarillo's new Olsen Park school.

LONG CABLE LIFE. Crain's crew prepares to make the overhead service connection. Because this tough power cable is highly resistant to abrasion, moisture, and weathering, long cable life is assured.

"Package" ion exchange equipment for lab or pilot plant . . . from stock

Laboratory ion exchange column

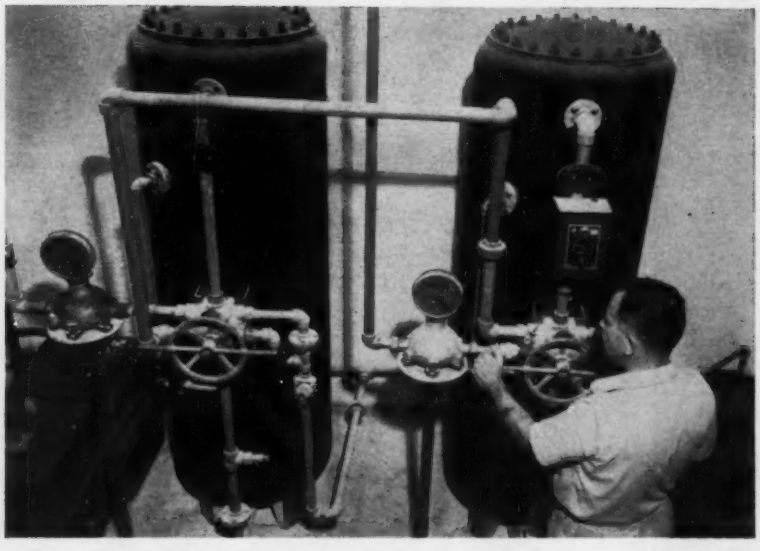
The Permutit laboratory or lecture-table kit includes a 1½" O.D. glass tube with one end drawn down to fit ordinary laboratory rubber tubing, the ion exchange resin or resins required and literature describing ion exchange experiments. The user supplies the

stand, clamps, tubing, stoppers and beakers. The tube will hold sufficient Permutit Q ion exchange resin to remove 20 to 25 grains of hardness.

This simple set-up is used for demonstrating ion exchange processes such as softening, dealkalizing or demineralizing water and for experiments in removal of impurities from process solutions and separation of metals from leached ores or waste liquids.

MBD-6A mixed bed demineralizer

The MBD-6A unit (6" diam.) contains a mixture of Permutit Q cation exchange resin and Permutit S anion exchange resin. It will demineralize 1 to 2 gpm of water to a low total solids, low CO_2 and low silica content. Refills containing pre-mixed resin are available. Each refill has a capacity of approx. 1500 grains total electrolytes as $CaCO_3$. When the unit is exhausted, the fill may be discarded or regenerated and re-used.



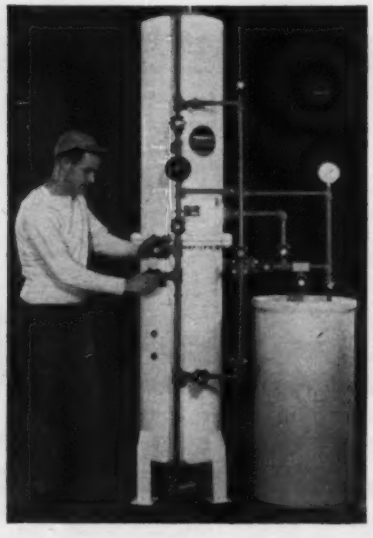
A conductivity cell is mounted in the outlet line to be used with a conductivity meter for measuring the electrolyte content of the effluent and thus indicating when the resin bed is exhausted.

Standard equipment includes the MBD-6A with initial fill, faucet adapter and hose and conductivity cell. Optional equipment: conductivity meter, resin refills and an auxiliary tube for regenerating the resins.

MBD-15 mixed bed demineralizer

This compact unit will demineralize 6 to 7½ gpm of water to an average conductivity of 0.15 micromhos (approx. 6,000,000 ohms specific resistance per cm or 0.05 ppm total electrolyte content). CO_2 will be reduced to 0.1 ppm and SiO_2 to about 0.1 ppm.

Capacity of the MBD-15 between regenerations is approx. 20,000 grains total electrolytes. For example, it will demineralize



3420 gallons of water containing 100 ppm total electrolytes or 1710 gallons containing 200 ppm total electrolytes. When the unit is exhausted, the resin bed can readily be regenerated without removing the resins from the tank. The plastic regenerating tank is used for both regenerants.

The MBD-15 is supplied piped and partially assembled and requires connecting together only 3 flanges other than the connections to influent, effluent and waste lines.

16", 24" and 30" diam. single bed units
(see photo above)

Diameter of unit	16"	24"	30"
Approx. flow rate (gpm)	10	20	30

Construction of these "package" units is of the same heavy-weight materials used for Permutit's large custom-designed units and includes rugged PVC plastic interior piping and plastic strainers, full 3/16" thick rubber lining steam-cured and vulcanized to the heavy gauge steel shell. The entire lining is spark-tested at 25,000 volts. Exterior piping is high strength plastic.

Standard equipment includes a rubber-lined Permutit multiport control valve for each unit, acid pump, corrosion-proof plastic tank for cation regenerant and steel tank for anion regenerant. All parts are normally kept in stock for immediate shipment and are described in standard drawings.

• • •

For complete information, write to The Permutit Company, Dept. EW-98, 50 West 44th St., New York 36, N. Y. or Permutit Company of Canada, Ltd., Toronto 1, Ont.

PERMUTIT®

rhymes with "compute it"

A DIVISION OF PFAUDLER PERMUTIT INC.

Water Conditioning

Ion Exchange • Industrial Waste Treatment

running at
MAXIMUM CAPACITY
for only ONE YEAR

THE SANGAMO J2 METER MAKES

23,343,648

FEWER REVOLUTIONS THAN ANY OTHER SINGLEPHASE METER!

The J2 Watthour Meter is the slow speed meter

Figure it out for yourself: If a class 100 meter carried a 100 amp. load day and night, it would measure 210,240 kilowatthours in one year's time. The Sangamo Class 100 J2 Meter, with its 6.0 constant, makes only 166⅔ revolutions to measure one kilowatthour. It would take 35,040,000 revolutions to measure 210,240 kwh. Meters with a 3.6 constant require 277.7 revolutions per kilowatthour and would have to make 58,383,648 revolutions to measure the same 210,240 kwh. That's a difference of 23,343,648 revolutions. Whether Class 100 or Class 200, Sangamo J Meters measure full capacity loads with 40% fewer revolutions.

Fewer revolutions mean less wear on all moving parts . . . and *less wear means longer service life.*

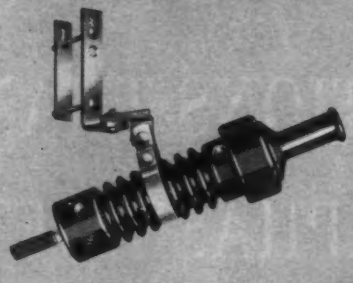
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

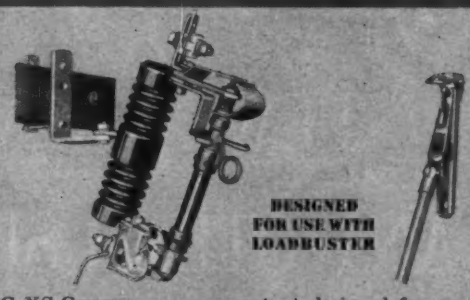
JH58-6

For every distribution system

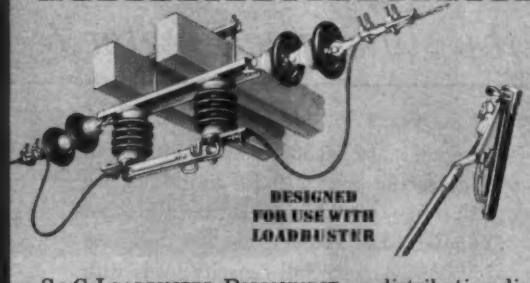
Four devices for low cost load switching at today's higher voltages and loads



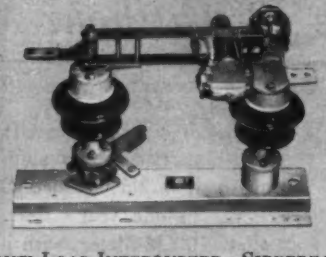
S&C POSITECT—enclosed cutout for full load switching, up to 200 amperes at 5 kv (or as a disconnect—unfused—to 300 amperes). Continuous rating: 50 and 100 amperes as cutout, 100 and 300 as disconnect. Note interrupter attachment at left.



S&C XS CUTOUT—an open cutout designed for use with LOADBUSTER®. Rated 100 amperes continuous as a cutout or 200 amperes continuous with disconnect blade. With LOADBUSTER it will switch full load, and associated charging and magnetizing currents.



S&C LOADBUSTER DISCONNECT—a distribution disconnect, with full published ratings and station-type performance. Rated 15 kv, 400 amperes continuous, 20,000 amperes momentary—95 kv or 110 kv BIL. With LOADBUSTER it can switch all loads, and associated charging and magnetizing currents.



S&C ALDUTI LOAD INTERRUPTER—SIDEBREAK STYLE—three-pole load switching device of long recognized capability. Used primarily for key sectionalizing points. Will interrupt all loads through 600 amperes. Made in 7.2 and 14.4 kv ratings.

S&C ELECTRIC COMPANY

Load switching is a real concern in modern distribution systems, with line voltages of up to 14 kv and load currents as high as 600 amperes. At these voltages and loads, it is impossible or extremely hazardous to open main or branch feeders with ordinary disconnects and cutouts.

Dropping all loads at the source, simply to open a single branch feeder, results in intolerable service interruptions. One alternative—switching with link-break cutouts—is an undependable makeshift. Another alternative—group operated disconnects—still doesn't bring full positive load switching, and is costly.

The S&C solution is a complete "stable" of distribution cutouts, disconnects, and load interrupters—all capable of providing full load switching, at prices to match distribution system economics.

The POSITECT Enclosed Cutout has its own load interrupter attachment. Two other devices—the XS Open Cutout and the Tool Operated Disconnect—are designed to take S&C's portable loadbreak tool, LOADBUSTER®. Finally, the S&C ALDUTI Load Interrupter has a built-in interrupting unit. This reliable interrupter switch has been the standard of the industry for many years.

For additional information on how to give your distribution system universal load switching capability, write to S&C.

S&C Electric Company
4421 Ravenswood Ave.,
Chicago 40, Ill.

In Canada: S&C Electric Canada, Ltd.
8 Vansco Road,
Toronto 14, Ontario

Disconnects • Cutouts • Fuse Links • LOADBUSTER • Power Fuses • Interrupters • Metalclad Switchgear

Specialists in High-Voltage Circuit Interruption Since 1910

LOADBUSTER®...

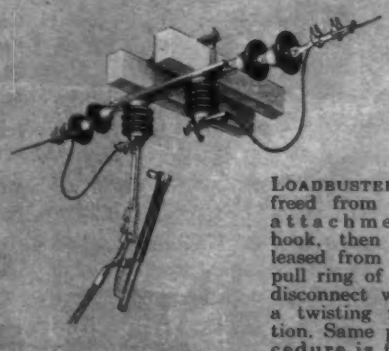
S&C's portable loadbreak tool

This new portable loadbreak tool is used at the end of a universal hook stick for opening disconnects and cutouts designed for use with it. On today's heavy loads, to 400 amperes, and up to 15 kv, this device gives arc-free load switching.

S&C manufactures two distribution devices mated to LOADBUSTER, the Tool Operated Disconnect and the XS Open Cutout. The sequence below illustrates LOADBUSTER opening the S&C Tool Operated Disconnect.

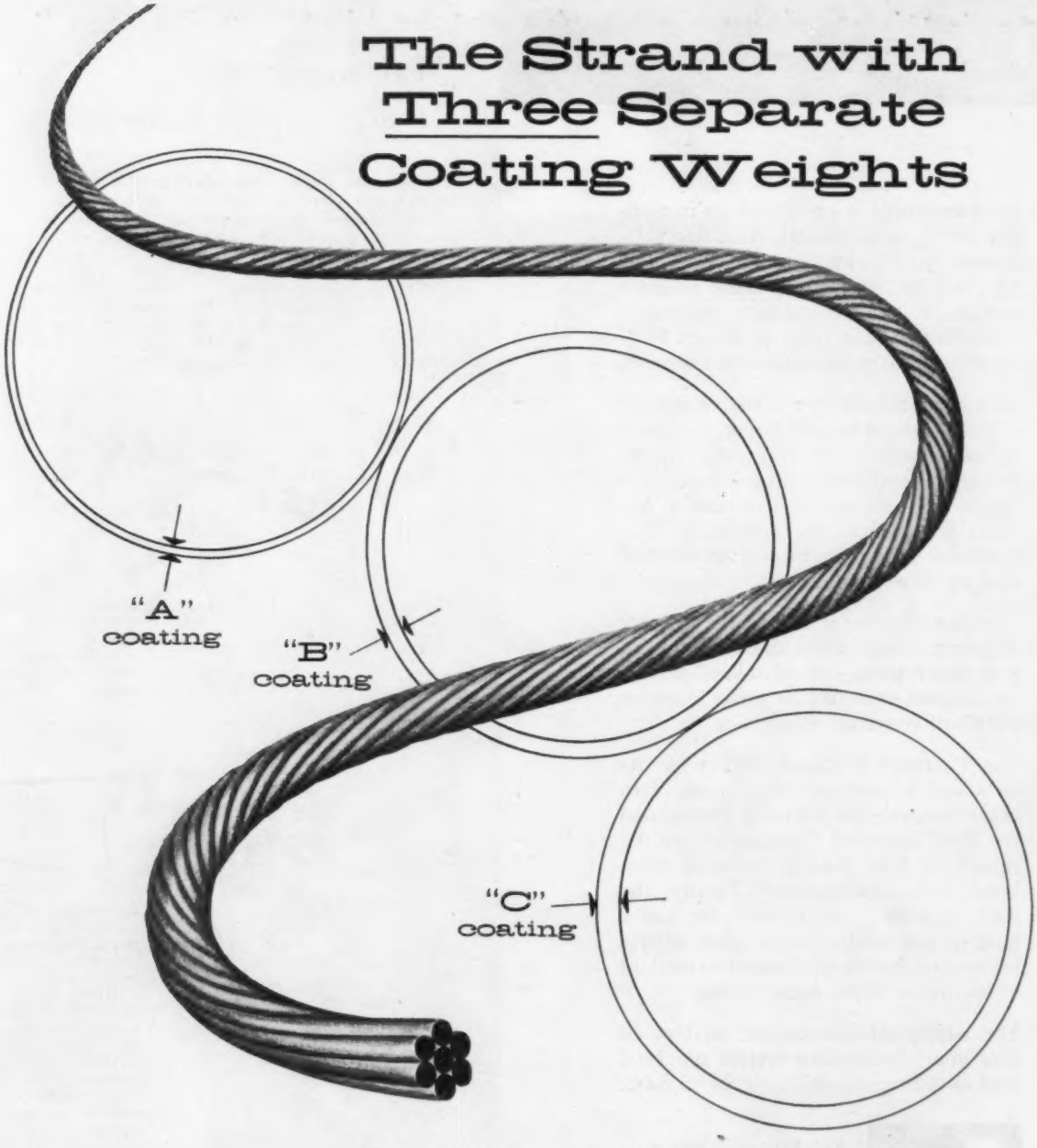
LOADBUSTER is hooked to attachment hook and pull ring of the Tool Operated Disconnect, preparatory to opening.

LOADBUSTER is pulled downward, first opening disconnect blade and providing shunt path across opening; continuing down, the circuit is then interrupted in LOADBUSTER, which latches open.



LOADBUSTER is freed from the attachment hook, then released from the pull ring of the disconnect with a twisting motion. Same procedure is followed for cutouts mated to LOADBUSTER.

The Strand with Three Separate Coating Weights



To meet the full range of field conditions, Bethlehem offers strand with three separate coating weights – A, B, and C. Coating A, the lightest, is equal to extra-galvanized. Coating B is twice as heavy. C, which offers the greatest protection of all, is a triple-weight coating. Thus you can get exactly the right "armor" for each individual installation.

The coatings are made of dependable zinc, which guards the steel wires from corrosion. Whichever weight you choose, the coating will be uniform and ductile, and tightly bonded to the steel.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

to solve system problems for the industry"

"Concentrate on all new and long-range electric utility industry system problems . . . devote all your time and efforts to their solution. That's the clear-cut assignment for the special staff of engineers who comprise the Westinghouse Electric Utility Engineering Department.

"Their studies of the *complete* power system go beyond the 'how-it-works' boundary. They search for and add to the 'why' knowledge.

"Through the Westinghouse policy of plowing back earnings into long-range system studies, these engineers are continuing to develop basic concepts for the power systems of today and tomorrow. This work is reported on the following pages."

J. K. Dillard, Manager
Electric Utility Engineering Department
Westinghouse Electric Corporation

In the Westinghouse Electric Utility Engineering Department . . .

Creative engineering is at work

on super power systems of the future

SPONSOR ENGINEERS PROBE THE FUTURE WITH ELECTRIC UTILITIES

During periodic visits to electric utilities, Sam Griscom and his fellow-Sponsor Engineers provide vital personal communication between engineers in utilities and those in the Westinghouse Electric Utility Engineering Department.

Sponsor Engineers discuss original investigations and counsel on the latest findings of long-range studies at Westinghouse. They review future system plans with utilities and search for problems that call for extensive probing or task force attack. The result—new techniques for system planning, better-engineered systems for tomorrow.

Through their advanced work in the Westinghouse Electric Utility Engineering Department, Sponsor Engineers have acquired special skills and a special knowledge of the utility power system. Through their contacts with electric utilities throughout the country, they have dug to the bed-rock of a great many field problems. They have anticipated and solved others.

ADVANCED DEVELOPMENT ENGINEERS TACKLE LONG-RANGE PROBLEMS

To Derrill Shankle and his group of Advanced-Development Engineers, the power systems of the future are a challenge . . . a set of problems that demand solutions . . . today.

For example, in the power systems of tomorrow, the selection and location of generating units will be a far more critical problem than it is now. Computer programs must replace today's rule-of-thumb procedures to permit the consideration of more factors and alternate plans. Westinghouse Advanced Development Engineers are perfecting these programs now.

At the same time, they are developing digital techniques for the study of economical load flow, short-circuit and transient stability . . . new tools for the system planning engineer.

As the voltages for transmission increase, so do the problems of radio influence, corona loss and excessive lightning outages. Through the Westinghouse policy of plowing back earnings into long-range studies, the entire industry is gaining new knowledge concerning all these phenomena—knowledge that will be necessary for easy transition to the super voltages of the future.

DISTRIBUTION ENGINEERS EXPLORE NEW CONCEPTS OF SYSTEM PLANNING

In the next seven years, electric utilities will add enough generation to power another America. Distributing that power economically, presents challenging problems that demand imagination and creative thinking.

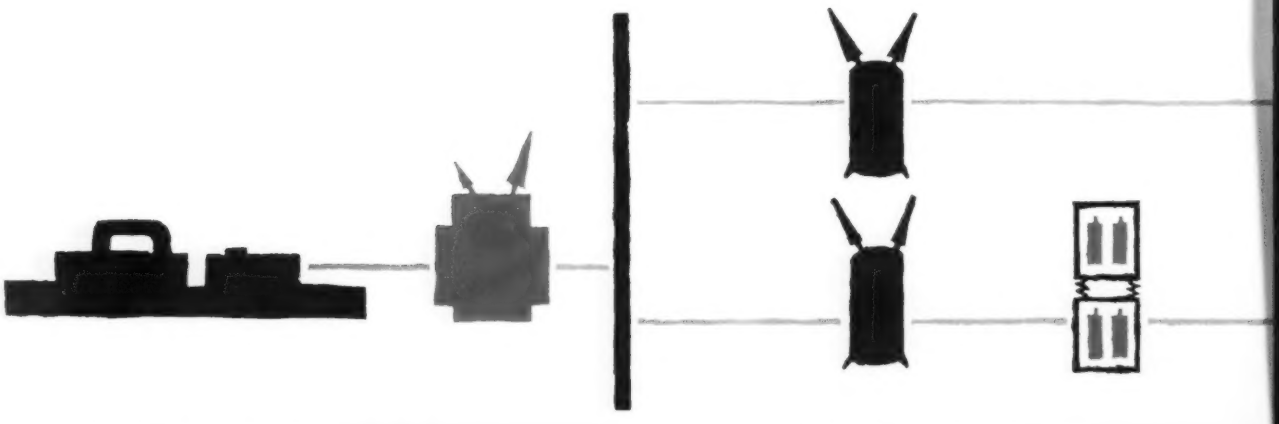
Bob Lawrence and his staff of Distribution Engineers are answering this challenge by exploring countless new and promising concepts of long-range system planning.

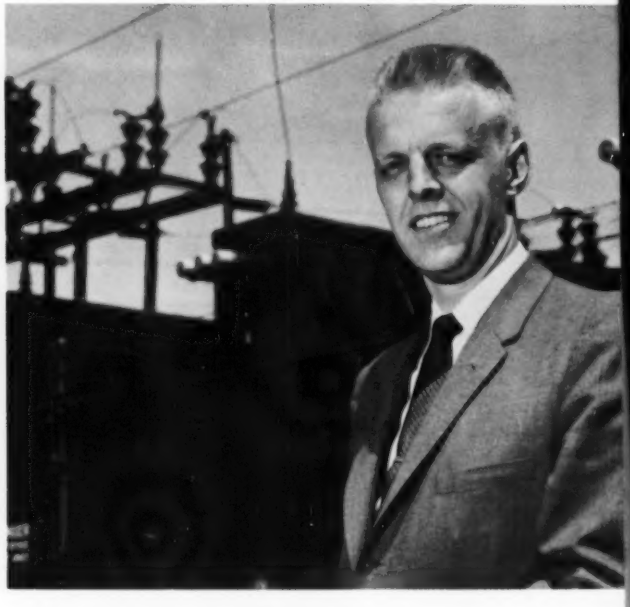
- What subtransmission, primary- and secondary-voltage levels should be used to serve the future load?
- Which equipment-circuit arrangements will be both economical and reliable?
- What about feeder capacities . . . substation sizes and locations?

These are a few of the areas in which answers are being sought today by the Westinghouse Distribution Engineers.

YOU CAN BE SURE...IF IT'S Westinghouse

From generation to distribution, Westinghouse





SPONSOR ENGINEER HELPS UTILITY PLAN TIE-IN OF SUPERCRITICAL UNIT

When the turbine-generator is a radically new design, the problems of tieing it into a system are greatly accentuated. A good example is the 5000-psi *supercritical* Eddystone Unit No. 1 of the Philadelphia Electric Company.

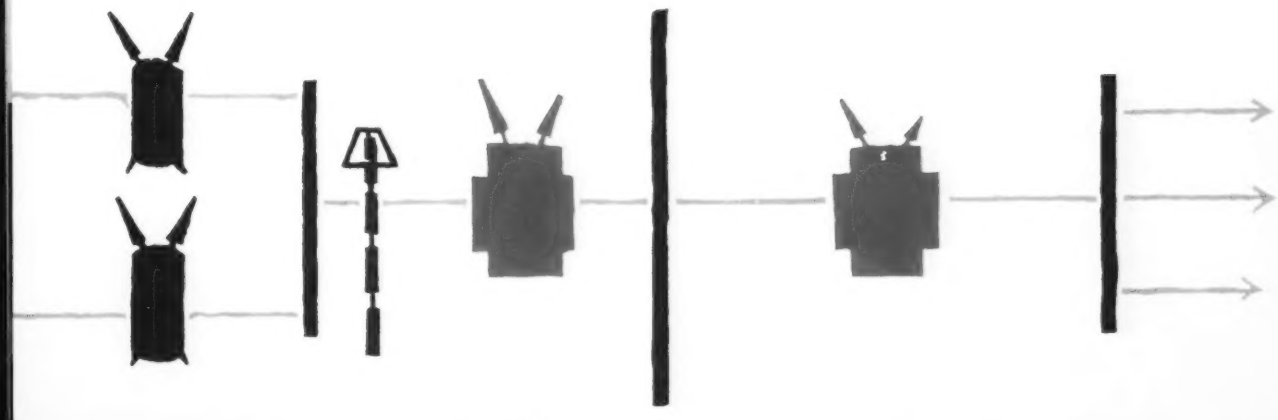
Working with the utility engineers, Chuck Wagner investigated the effects of the characteristics of this design on the stability of the unit with the system. He also helped determine the protection and operating requirements. These investigations will provide the industry with the answers for other large units, as they gain more widespread application.

PREDICTS PERFORMANCE OF SERIES CAPACITOR APPLICATIONS

By cooperating with utilities that are now designing modern high-voltage transmission systems, Westinghouse Sponsor Engineers are getting data that will benefit the entire industry.

For example, Ted Bliss helped several utilities engineer future series capacitor applications. In doing so, he investigated the possibilities of ferroresonance, transient overvoltages, and subsynchronous operation of induction motors. Drawing on the modern analytical facilities at Westinghouse, Ted Bliss determined the protection and operating procedures required for these installations.

Sponsor Engineers are ready to help



IF ONE LIGHTNING ARRESTER DOES THE JOB, WHY USE MORE!

As the result of a field study with the engineers of the Louisiana Power and Light Company, Sponsor Engineer Jim Clayton (above) and Advanced Development Engineer Bob Hileman have collected data that will help the industry apply lightning arresters on a more realistic and economical basis.

Through a traveling wave analysis, they are able to determine surge voltages at all points remote from the arrester. They have found that in many substations, it's possible to protect the entire station with a single set of arresters. The safe use of fewer arresters is now possible.

20-YEAR DISTRIBUTION PLAN TO MEET ZOOMING RESIDENTIAL LOAD

Within 20 years, today's residential loads will increase threefold. That was the first report of an extensive study made for a southwest utility.

Working closely with the utility engineers and their consultants, Westinghouse Sponsor Engineer Miles Maxwell prepared a 20-year plan for the distribution system. Flexible and complete in every detail, this long-range plan provides for 12-kv voltage as the most economical.

Through long-range studies such as this, Westinghouse Sponsor Engineers are helping the industry plan for fast-growing residential loads.

YOU CAN BE **SURE**... IF IT'S Westinghouse

Special industry problems call for

WESTINGHOUSE TRACES MYSTERIOUS FAILURES OF LIGHTNING ARRESTERS TO SWITCHING SURGES

Advanced Development Engineers and Sponsor Engineers often serve as task forces to investigate apparatus failures that can't be readily explained.

For example, John Skooglund (above) and Cliff Lane checked the mysterious failure of a lightning arrester on a 345-kv system. Field measurements with high-speed cathode-ray oscillographs and extensive analog computer studies proved that the trouble was caused, not by lightning, but by disconnect switching surges.

Westinghouse then developed a series resistor device for disconnect switches that effectively dampens high-voltage surges. Thus, Westinghouse has given the industry the answer to a problem that defied solution for many years.

JOINT PROGRAM IS DEVELOPING ACCURATE COMPUTER TECHNIQUES FOR EXPANSION PLANS

Westinghouse Advanced Development Engineers are working on computer studies that will provide the industry with more accurate data for long-range expansion plans. A joint project is now under way with the Public Service Electric & Gas Company of New Jersey.

Clarence Baldwin of Westinghouse (above) and Charles H. Hoffman, Public Service Electric & Gas Co. engineer, recently reported that study groups are now developing advanced techniques of evaluation and computer logic in areas such as these —load forecasting, retirement of units, risk of shortage, transmission plans, yearly dispatch and production cost, capital cost determination and present worth economics.

special skills and special facilities

REVOLUTIONARY DIGITAL COMPUTER PROGRAM SOLVES VOLTAGE-CONTROL PROBLEM

Every regulator and capacitor application should be engineered, but engineering man power is too expensive to spend on repetitive analyses.

Working with the American Electric Power Service Corporation, Dave Reps and his associates in the Distribution Engineering section have perfected a digital computer program that solves typical primary feeder problems.

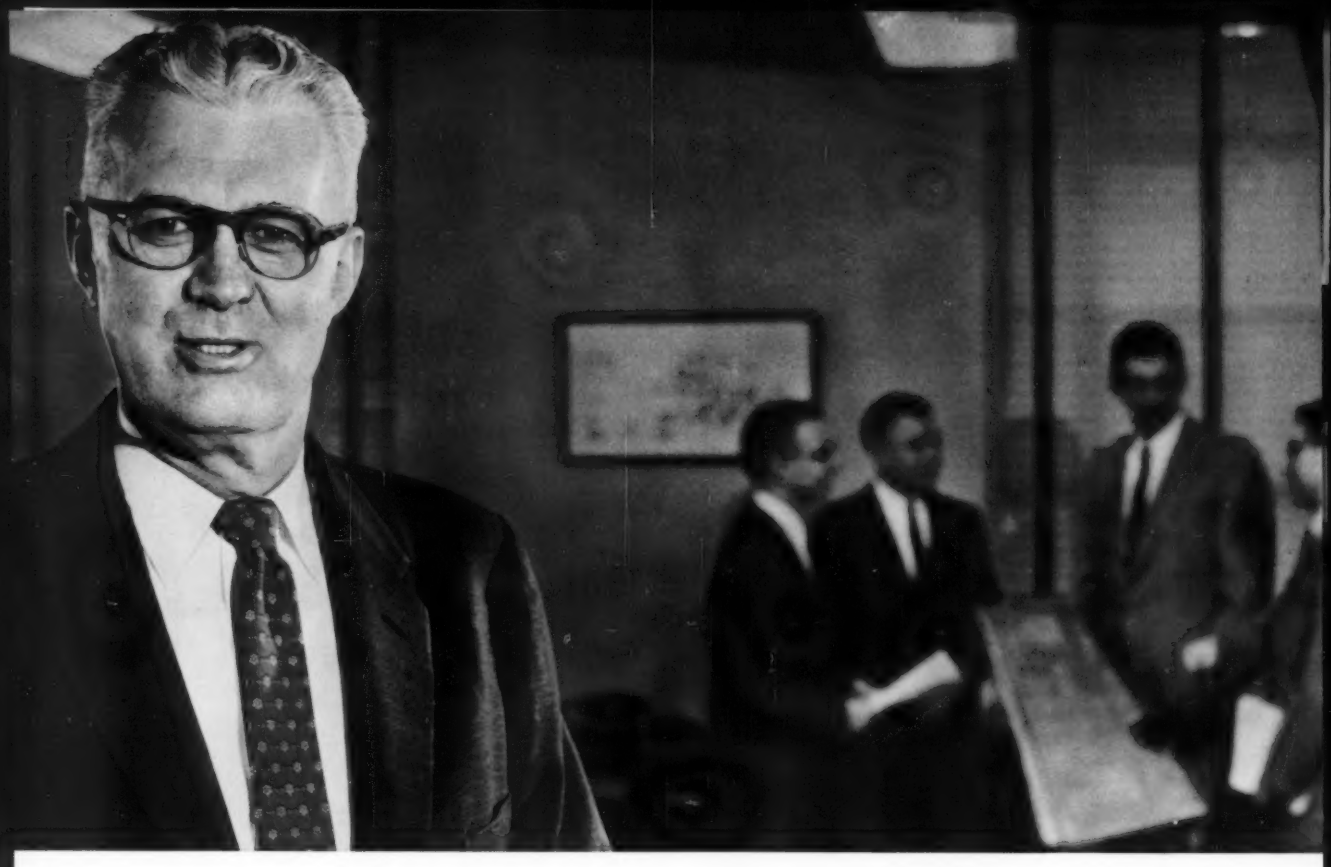
One hour is required to record the utility data on cards or tape. In one minute, the 704 computer calculates the solution—the ratings and location of the regulators and capacitors, and total application cost for alternative methods of controlling voltage on the feeder.

25% SAVINGS WITH HIGHER SECONDARY VOLTAGES FOR NEW ALL-ELECTRIC HOME AREAS

Through plowback of earnings into extensive distribution studies, Westinghouse has assembled data that clearly indicates the need for immediate consideration of higher secondary voltages for new residential areas.

All-electric homes with electric heating and cooling make present voltage systems uneconomical in most cases. Studies by Hank Lokay and his fellow Distribution Engineers show that higher secondary voltages in all-electric home areas would result in savings of at least 25 per cent. With such a system, a hundred or more homes would be served by a single transformer which, in turn, would be served by higher voltages . . . possibly 34.5-kv.

YOU CAN BE SURE...IF IT'S Westinghouse



Through coordinated project planning . . . you can save time and gain many services

Here is a time-saving service for the electric utility that selects the most *complete* line of advanced and coordinated apparatus for a new or expanded station.

Working with the electric utility and its consulting engineer, the Project Section of the Electric Utility Engineering Department can offer contributions based on the special knowledge and experiences highlighted on the previous pages. Carey Mann and his Project Engineering team can coordinate the project requirements with the many services in Westinghouse. You gain the advantages of one order, one contact, one responsibility.

HERE'S HOW THE INDUSTRY BENEFITS FROM WESTINGHOUSE LONG-RANGE STUDIES OF SYSTEM PROBLEMS

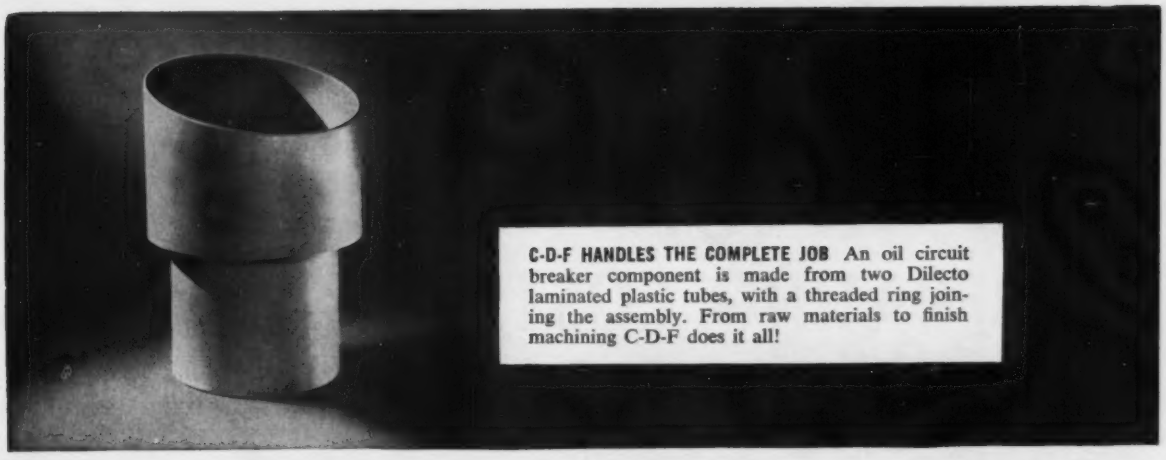
Through the Westinghouse policy of plowing back earnings into special and long-range studies, Electric Utility Engineers concentrate on the development of new system concepts that will help the industry meet future loads.

These engineers pass on the results of their work to the industry through Sponsor Engineers, AIEE papers and annual conferences with electric utility engineers. They also author the *Transmission and Distribution Reference Book*. Its value as the standard reference work on utility systems is proved by the sale of more than 50,000 copies.

Westinghouse considers this work of helping plan, evaluate, test and apply new ideas and systems its obligation to the industry . . . an obligation which it will continue to fulfill in the future as it has in the past.

CP-1048

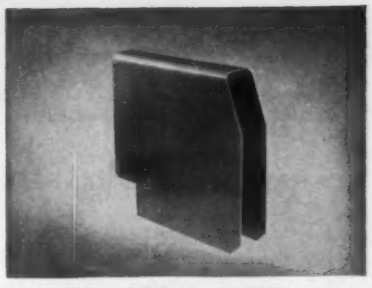
YOU CAN BE SURE...IF IT'S Westinghouse



C-D-F HANDLES THE COMPLETE JOB An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!

C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.

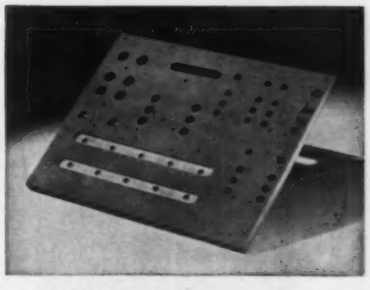


C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

Dependable equipment relies on C D F insulation!

C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE Budd COMPANY • NEWARK 15, DELAWARE

HERE'S HOW TO CUT OPERATING COSTS

Install Transformers That Stay Young, Live Longer

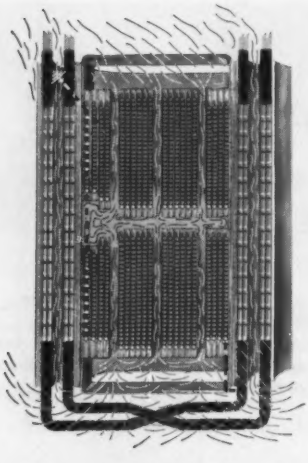
WHAT SHORTENS TRANSFORMER LIFE?

Heat and moisture do more to shorten transformer life than anything else. Once moisture gets into the oil, sludge forms—oil circulation slows down—winding temperatures increase—and insulation gradually weakens. This begins the aging process.

WHAT KEEPS TRANSFORMERS YOUNG? . . .

. . . Obviously, a means of controlling moisture and heat. That's why Kuhlman transformers are thoroughly dried inside and sealed air-tight and moisture-proof outside. Also, why generous ducts are spaced all through the windings to carry off excess heat and assure cool operation.

As an operator, you can get the most out of this built-in life by limiting excessive overloading—working with care and cleanliness around open transformers—and checking the condition of the oil occasionally.



Free movement of oil through the windings carries off heat, eliminates damaging hot spots, keeps the transformer young longer.

DOES CONDITION OF OIL AFFECT TRANSFORMER LIFE?

Perma-Kuhl Oil, used in Kuhlman transformers, is the finest coolant and insulator you can buy. Minimum care keeps it clean and clear.

The best oil, however, will oxidize and form sludge under abnormal operating conditions. Sludge impedes oil circulation, weakens insulation and, finally, will corrode steel. Routine inspections can avoid these harmful effects.*

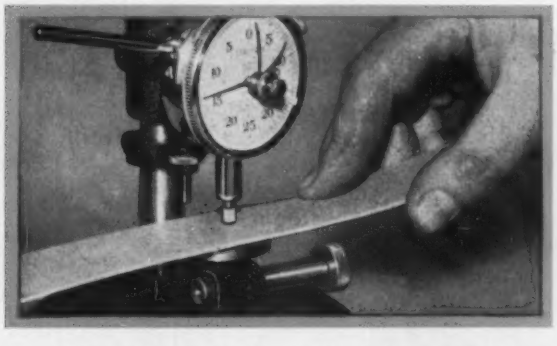
The dielectric strength of oil is accurately determined by laboratory testing.

HOW MANUFACTURING METHODS INCREASE LIFE

Design alone can't guarantee long life. It takes careful manufacturing to build endurance into a transformer.

**For facts on transformer oil behavior, write for "Kuhlman Kurrents," Volume 32, Number 3.*

Special emphasis is put on manufacturing controls at Kuhlman. Connections are tight; winding tensions are held within close ranges; core steel is processed with great care. Countless other rigid standards are observed.

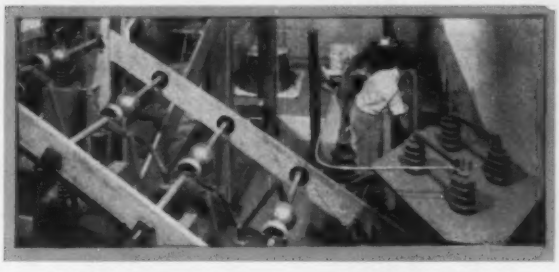


Painstaking checking of insulating material assures quality and accurate dimensions for long service.

The men who build Kuhlman transformers under these manufacturing controls are long in the business, and their skills lengthen the lives of the transformers they build.

HOW IMPULSE TESTING ASSURES LONG LIFE

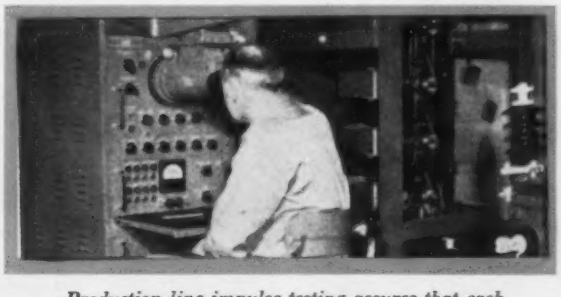
Every Kuhlman design approved for manufacturing and every pole-type transformer approved for shipment must pass the "Impulse Test." This test—which subjects the transformer and all its components to a simulated surge of lightning—gives positive proof of transformer quality.



Design impulse tests in the laboratory establish the quality and the lifetime impulse level of the transformer.

As a design test, it establishes the basic impulse strength of the transformer. This, at Kuhlman, is in excess of NEMA requirements to provide added quality and protection for longer, more useful life.

As a production test, it assures each finished transformer coming off the assembly line is free of defects, has design quality, and is ready for long-term, trouble-free service. Any hidden weakness that might cause trouble—no matter how minor—is quickly detected by these rigorous final tests.



Production line impulse testing assures that each unit coming off the production line meets Kuhlman standards.

Today the big difference in transformers is quality

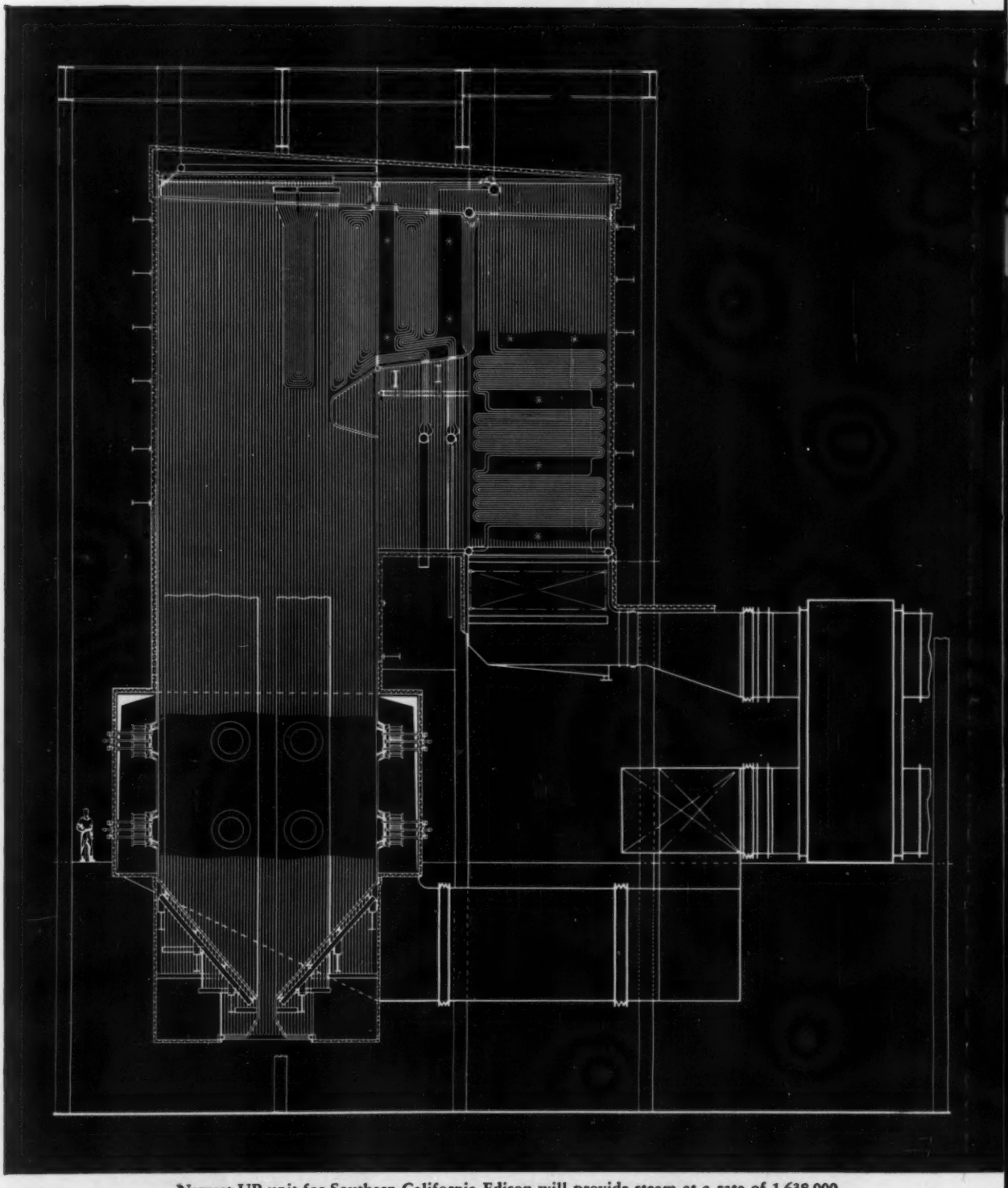
Whether your job is specifying, ordering, or keeping transformers in service, you'll find Kuhlman quality means longer life, better service, at lower cost.

KUHLMAN DISTRIBUTION TRANSFORMERS

KUHLMAN ELECTRIC COMPANY General Offices: Birmingham, Michigan

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

A Big Step Forward-



Newest UP unit for Southern California Edison will provide steam at a rate of 1,638,000 lb per hour to a 210,000 kw turbine at a pressure of 2,400 psi and at a temperature of 1,050/1,000 F. Completion of the unit, which will burn either natural gas or oil, is scheduled for November, 1960.

Why Southern California Edison Purchased B&W Universal Pressure Boiler for 2400 PSI Operation

Once-Through Unit Reduces Capital and Operating Costs —Makes Use of Variable Pressure Possible

A big forward step in holding the line on the cost of producing electricity was taken by Southern California Edison in purchasing two B&W Universal Pressure units for its station at Huntington Beach, California.

Solid savings both in installed first cost and in operation stand behind this decision. Here are the facts:

INSTALLED COST

1. The overall cost of a Universal Pressure Boiler represents a saving over a drum type boiler for identical conditions.
2. Because height and weight of the UP Boiler are much less than those of drum type boilers, there are worthwhile savings in building and construction costs.
3. Superheat, hot reheat and cold reheat steam piping are reduced.
4. Foundation costs reduced because of 650 ton saving in weight of unit.
5. Drum transporting and lifting costs eliminated.
6. One level of stairs, walkways and elevator landing eliminated.

OPERATION

Many significant advantages from the UP's unique operating features helped shape Southern California Edison's decision. Here is what they found:

1. Constant steam temperature at all loads without use of tempering equipment.
2. Rapid response to load change.
3. Quick start up and shut down.
4. Simplified control system during normal operation.
5. Minimized operating complications when turbine is tripped.
6. Complete flushing of preboiler and boiler system is accomplished during every start up and shut down.
7. Reduced dependence on safety valves.
8. Elimination of water level gauge glasses and indicators.
9. Ease of acid cleaning.

VARIABLE PRESSURE OPERATION

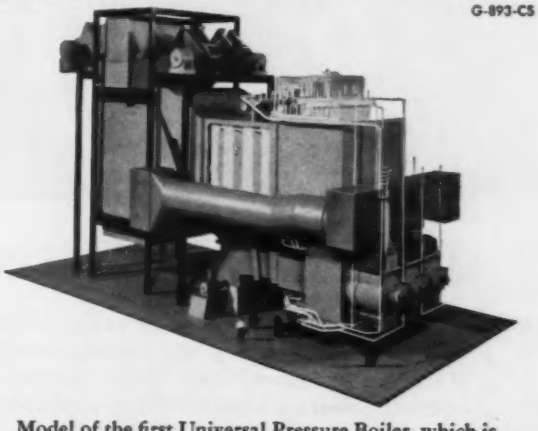
The Universal Pressure Boiler can be operated with variable pressures and constant steam temperature over a wide load range. This not only means more efficient operation at partial loads, but also cuts auxiliary power requirements at lower loads.

The Universal Pressure Boiler helps the utilities' pressing need to hold the line on most of the important factors affecting cost of power generation.

Behind its many benefits stands the concrete performance of America's first successful commercial application of the Universal Pressure principle at the Philo Plant of the Ohio Power Company on the American Electric Power System. This unit has had a full year of performance under diversified conditions. Performance, ease of operation and freedom from major troubles have exceeded even the optimum original expectations.

We would be glad to discuss with you the advantages that the Universal Pressure Boiler can bring to your plant. Write to The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

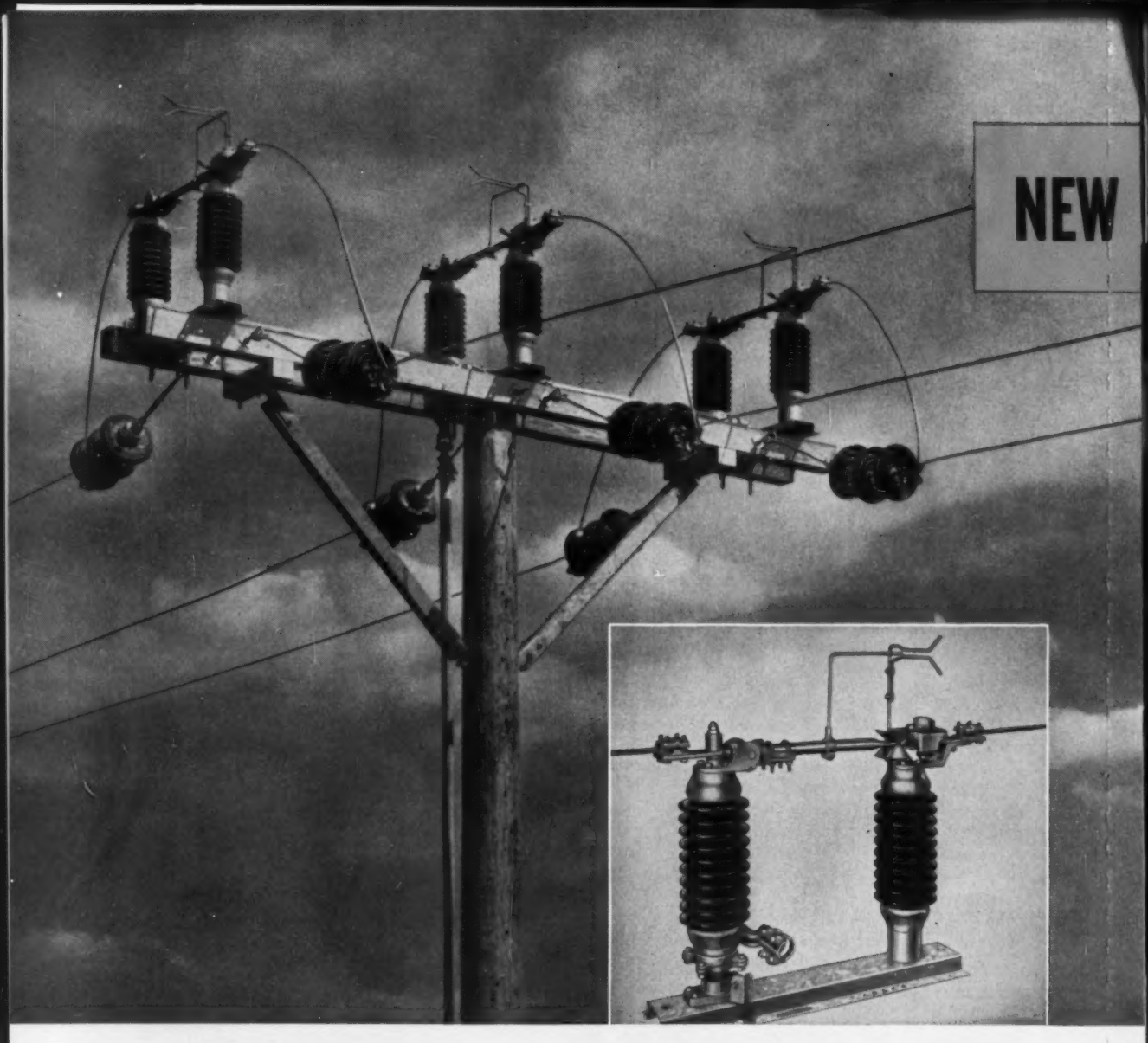
G-893-C5



Model of the first Universal Pressure Boiler, which is now operating, uses once-through principle by which water, under pressure, is forced in one end of the system and emerges at the other end as superheated steam. This principle eliminates need for a drum.

BABCOCK & WILCOX

BOILER DIVISION



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney *Self-Aligning* side-break switches to be installed faster and more economically than other types.

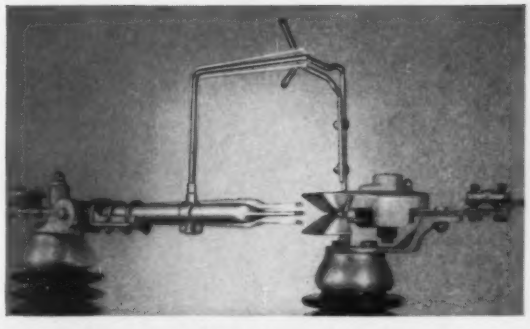
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

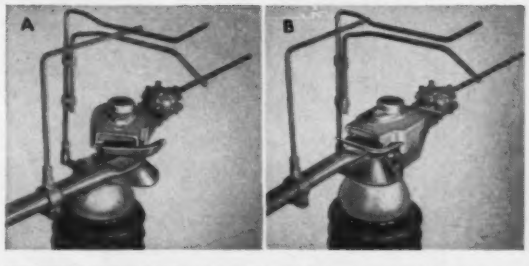
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

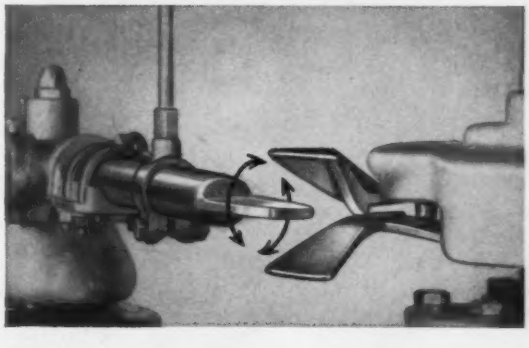
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

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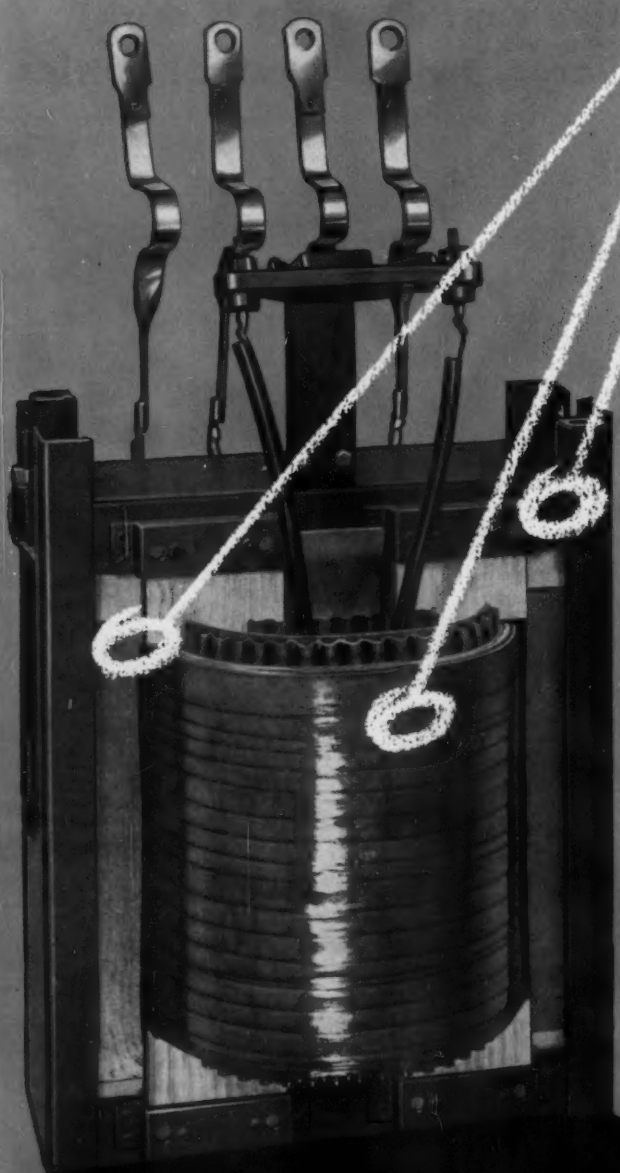
FOR BETTER CONSTRUCTION... SAFER MAINTENANCE

Specify Kearney Products

Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

The new Moloney Distribution Transformers have improved efficiency and dependability. These improvements were made possible by the re-design of the entire core-and-coil assembly.

NOW IMPROVED EFFICIENCY . . . DEPENDABILITY



Features of this new design are:

- A completely new core which results in lower exciting current.
- The redesigned coil with lower losses and lower impedance giving better voltage regulation.
- A new framing structure and strong, adequate blocking keep the core-and-coil in the proper position even under short circuit conditions.
- Reduced weight.

Take advantage of these improvements which are the result of Moloney's continuous research and development programs . . . Specify Moloney Transformers . . . All Along The Line.

Moloney Pole Type Distribution Transformers are available in both conventional and CSP types.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

MCDO-21

September 8, 1958

PLAN '59

Announcing A Program of Reports on . . .

Modernizing Electrical Power Systems

Electrical World is convinced that the biggest challenge facing the American utility industry is that of thoroughly modernizing its plant and equipment. It is a big job, but a vital one. Keeping system facilities, techniques, and equipment completely up-to-date and modern is the key to serving tomorrow's loads at reasonable rates in the face of rising costs and prices.

For the past two months the editors of Electrical World have been engaged in a concentrated effort to evaluate the impact of obsolescence on today's electric utility systems; to measure the extent to which present system facilities are becoming "old before their time", and to weigh what can be done about it. This activity has three objectives.

First, to estimate the effort that needs to be made, in the form of modernization, to prepare existing electric utility systems for the predicted growth in the next decade.

Second, to point up the opportunity offered the electric utility industry, through improved design, construction and operating practices to provide better service at minimum cost.

Third, to focus industry attention on the new tools, techniques, and equipment available to offset the effects of obsolescence of electrical system facilities.

This editorial evaluation of obsolescence will culminate in a series of five consecutive special reports that will run weekly beginning with the October 6 issue and continuing through November 3. Each report of the series will concern itself with the need and the opportunity for modernization in a particular system area.

A brief outline of each report follows:

Generation—October 6—A hard look at the age, size, and type of generating capacity to see why, when, and how fast units are being retired. An Electrical World survey will show modern trends in design of power plants. Examples will show how today's power plants are being modernized.

Transmission—October 13—A studied measurement of the effect that growth in systems, inter-connections, and station sizes is having on the adequacy of today's transmission. Transmission adequacy will be weighed in terms of voltage, capacity, reliability, and available rights-of-way. A summary of modernization methods will point to possible solutions.

Distribution and Metering—October 20—A weighing of the effect of mounting service quality requirements on distribution. And an analysis of the need for modernization in the areas of higher load capability, voltage adequacy, and appearance. In the area of metering, editors will focus on the cost of meter testing and servicing as it bears on the replacement of over-age meters.

Modern Service Functions—October 27—A demonstration of efforts being made to offset the effects of growth and technical obsolescence on the usefulness and life of facilities such as transportation, warehousing, communication, buildings, data processing and similar services.

Municipal and Industrial Modernization—November 3—An analysis of the need for modernizing street and highway lighting and the role of utilities in providing it.

A report on the contribution made by power companies in promoting industrial power system modernization and urban redevelopment.

INDUSTRY DELEGATION IN RUSSIA. From left, P. D. Reed, General Electric; J. F. Davenport, Southern California Edison; G. A. Price, Westinghouse; R. G. Rincliffe, Philadelphia Electric; Cisler; J. L. Singleton, Allis-Chalmers; D. S. Kennedy, Oklahoma G&E; E. L. Lindseth, Cleveland Electric; Edwin Vennard, EEI; and Harvey Bumgardner, Detroit Edison

Russia Tour Impresses U.S. Group

Information exchange was 'very worthwhile,' says Walker Cisler, head of the ten-man industry delegation. Time-saving construction methods, plant tours, inspection of dc transmission facilities are highlights

"Very worthwhile — we learned from them, and they learned from us," said Detroit Edison Co Pres Walker Cisler, as he enthusiastically described the 16-day tour of Russia's power plants just completed by a delegation of electric industry executives.

Interviewed shortly after he stepped off the plane in Geneva, where most of the group flew from Moscow to attend the second United Nations Conference on the Peaceful Uses of Atomic Energy, Cisler readily commented on the Soviet power facilities and other installations the group has visited.

"We covered only the European part of Russia," said Cisler, "because our time was too limited to go further east. We received very friendly treatment from Minister of Power Plants Alexei S. Pavlendo, his associates, and from all the operators of power facilities and the other installations we visited," he added.

Moscow Bureau Opens

McGraw-Hill Publishing Co has established a news bureau in Moscow to serve Electrical World and other company publications. William Coughlin, formerly chief of the firm's London bureau, is chief of the new unit.

The group was impressed by the way the Russians speed construction work by assembling component parts in the shop, or on the site before putting them into position. Cisler said that this resulted in "less work required in the actual erection.

"We were also impressed by the use of pre-cast concrete in parts for which we in the U. S. normally employ steel—beams and flooring, for instance.

"The Russians also use a substitute for plywood in forms for their concrete," Cisler went on. "This does not give a smooth finish to the concrete but it serves the purpose."

Cisler reported present installed capacity of Russian power systems

and industrial plants is about 48 million kw, with power doubling every five years until recently when the doubling period seems to have stretched out to about seven years.

"Plans are for bringing capacity up to something more than 100-million kw," he added.

Big Thermal Plant Underway

The group visited many outstanding thermal plants, including one that is operating with units of 150 Mw. "We realize there is a substantial number of 100-Mw units in operation," Cisler said. "And units of 300, 400 and 600 Mw are in various stages of planning and development. Eighty percent of the electric power generated in the USSR is thermal."

According to the official English language publication, Soviet News, the Russians are designing a 2.4-million kw thermal plant, containing 600-Mw units. Units will operate at 1,050 F in supercritical pressure range. Boilers will produce about 3.6 million lbs of steam per hr.

The American group saw the Kubiyshev hydroelectric project which was dedicated recently by Premier Nikita Khrushchev. This plant has twenty 115-Mw units for a total capacity of 2,300 Mw.

Cisler said that the Stalingrad hydroelectric plant now under construction will be even bigger—with 22 units of 115 Mw each for a total of 2,530 Mw. The Stalingrad plant will come into operation before the end of this year. Other hydroelectric plants of substantial size are also underway with even larger generating units.

Detroit Edison's president reported that the USSR has many transmission lines of 110 and 220 kv in operation. He noted that some 400-kv lines are also in service and operating satisfactorily. These and others under construction eventually will be changed over to 500 kv operation.

On dc transmission, Cisler said that an experimental line at 200 kv approximately 60 miles long is now in operation. Experience gained from this line is enabling the Russians to plan operation of another dc line at 800 kv. Following this, other dc lines of comparable voltage will be built to transmit large blocks of power from areas of generation to areas of utilization.

Air-blast circuit breakers are operated exclusively on all high-voltage transmission lines, Cisler said. "There's every indication that this type of equipment is operating satisfactorily, and we inspected some of the most recent designs.

"Transformers of large capacity are installed, and the change from 400 to 500 kv will be made by changing connections on present transformers."

The Americans found that experiments leading to higher temperatures and pressures (including supercritical) are being made at the Soviet Thermal Research Institute.

The party visited several atomic energy research and development facilities, including the 5-Mw plant which has been operating for the past four years near Moscow. Cisler said that this plant supplies steam to a nearby conventional steam power plant. The reactor is also used for experiments on improved fuel elements and performance in general.

The group also toured experimental atomic installations using plutonium fuel elements as part of the Russians' fast-neutron reactor development program.

All the Russians the American party met expressed a strong desire to exchange experiences and learn American methods and procedures.

"We were asked many questions which we answered to the best of our knowledge," he added. "Many Russians with whom we talked had never been briefed on electric power in the U. S., and were anxious to know as much as possible.

"There were no attempts to make comparisons, and no boasting by either side—just genuine interest. A party of Russian engineers, construction men, operators, and managers will visit the U. S., probably early next spring." Cisler concluded.

On the evening of their departure from Russia, the entire American delegation was entertained by Minister Pavlenko, according to a dispatch from McGraw-Hill's new Moscow bureau. A reception in their honor was held at the Sovietskaya restaurant, reportedly the best in Moscow.

The delegates left Moscow by plane early in the morning of Aug. 30. After the atoms-for-peace conference in Geneva (see below) they will tour Western Europe.

Their timetable calls for them to visit the Brussels Worlds Fair and Belgian Atomic Laboratory Sept. 8-10 as next stop after the conference. They will also visit the French atomic installation at Saclay, and British plant at Calder Hall.

No Rush to Atom Power Seen

Harnessing the atom to produce commercially competitive electricity on a large scale is unlikely in the near future.

That is the message which seems to emerge from the tidal wave of fact and theory pouring from the world's foremost nuclear scientists gathered at Geneva for the UN's Second International Conference on Peaceful Uses of Atomic Energy.

Here are some highlights from the opening sessions:

Conference Pres Francis Perrin, of France, struck the keynote when he said: "In the near future, atomic energy can play an important part in a fairly restricted range of countries." The U. S. and Russia, he added, are examples of countries where traditional power resources restrict the importance of nuclear energy.

Sir Lester Owen, managing director of Britain's Atomic Energy Authority, admitted that Britain might be pushing too fast to get atomic power into the electric grid.

Russian expert V. S. Emelyanov agreed with the general opinion that extensive research into all reactor types is needed before a country can commit itself to a definite nuclear program.

Dr. Edward Teller, of the U. S., put a 30-year minimum on the time needed to get commercial power from fusion, and added that thermonuclear power would probably not be practical in this century.

P. G. Thonemann, British expert, said conditionally that fusion might generate electric power within ten years, but another ten years would be required to determine whether it would be economical.

Coal in the Northwest?

With an eye to the future, WWP and PP&L are exploring a 70-million ton coal field in Washington. And Kittitas PUD's proposed Cle Elum project passes its second milestone

The Pacific Northwest has no intention of abandoning hydro, but utilities in that area are giving serious consideration to coal as a future energy source.

Washington Water Power Co and Pacific Power & Light Co have geologically mapped coal seams near Centralia, Wash., containing 70 million tons of fuel.

Purpose of the joint investigation, say officials of WWP, is to determine the feasibility of using the area's sub-bitumious coal to augment Pacific Northwest power supplies when economic hydro sites approach full development.

The companies presently are thinking in terms of future steam for a base load operation, with the possibilities of teaming the thermal operation with seasonal dump hydroelectric energy as a fuel saver.

Probable cost of getting the coal out of the ground and under boilers was described as one of the key facts to be determined by the field investigation.

The coal lies relatively close to the surface and would be susceptible to strip mining PP&L sources said.

WWP Pres Kinsey M. Robinson termed progress of the investigation satisfactory.

Even though the record hydro development program now underway will add 7 million kw of generating capacity in the Pacific Northwest in the next few years, Robinson said that additional energy sources will be needed to meet the region's long-term load growth.

"This coal study is part of our long-range planning to be ready to meet the needs of customers at the time when economics dictate the construction of coal plants," Robinson said. "We are looking carefully into both coal and nuclear fuel as future thermal energy sources."

Fuel tonnage blocked out by core drilling crews since the work started last September was estimated to be enough to supply a 300,000-kw steam plant for about 50 years.

Three drilling crews are working in the 33,000-acre section of northern Lewis County and southern Thurston County where the two power companies hold exploration and development rights.

All of the 33,000 acres have been mapped topographically by aerial mapping methods, and about 2/3 has been mapped geologically.

Core drills are used to take cross-section samples of the underground structure in the coal-bearing area. From these samples, geologists and engineers are mapping the depth, thickness, and quality of coal seams. More than 14,000 ft of core material has been taken out for analysis to date, officials said.

On its proposed coal-hydro Eden Ridge project in southwestern Oregon, PP&L is completing preliminary design of the hydro phase and finishing up geology studies of the adjacent coal fields.

PUD Weighs Steam Plant

Meanwhile, Kittitas County PUD is moving into the third stage of its investigations concerning a proposed 250,000-kw coal-fired plant in the Roslyn-Cle Elum area of Washington.

The PUD accepted a report of H. Zinder & Associates, Seattle, dealing with characteristics and costs of the proposed plant, and authorized the firm to define the market for its power. An earlier study (EW, Dec. 17, 1956, p. 40) had already found coal supplies adequate.

The market report on Cle Elum is due about Nov. 1, according to Sol E. Schultz, Zinder manager. Earlier surveys have indicated that many utilities in the area are interested in buying steam power.

The report just accepted finds the Cle Elum plant to be feasible as to the engineering involved and proposes that it be completed by fall of 1963, when: "a substantial amount of new electric generating capacity must be added if utility loads of the Pacific Northwest are to be met."

Addition of the steam plant would increase the ability of the Pacific Northwest Power Pool to deliver firm power by about 425,000 kw at 55% load factor, declares the Zinder report.

Energy costs might average from 4.4 to about 5 mills per kwhr, Schultz said, adding that in combination with low-cost surplus hydro it "should compare favorably in cost with power from a number of non-federal hydroelectric projects being considered for construction in the Pacific Northwest."

Mine and steam plant together

would require a revenue bond issue of between $61.1 and $72.7 million, the PUD was informed. Fuel costs are put at 26.6¢ per million Btu.

The project would initially require one mine, operating all year to produce an average 457,000 tons of coal. After 25 years, or whenever capacity of the plant is doubled, a second mine would be necessary.

Proved reserves run to 65.8 million tons—enough to operate a 500,000 kw plant for 50 years—with probable reserves adding another 71 million tons.

The steam plant should initially operate for eight months out of the year, possibly longer in the future. Unit installed costs, less escalation and sales tax, range between $147.77 per kw at expected maximum turbine capability and $164.32 at turbine nameplate rating for the 250,000-kw plant.

Feasibility of the plant is based on obtaining secondary power from Bonneville Power Administration.

Firms BPA Hydro

The Zinder proposal calls for an exchange of energy and peaking capacity between BPA and purchasers of energy from the steam plant. Each purchaser would contract with BPA for his share of the steam plant's output to be wheeled to his load center over the federal grid. For each basic kw the customer buys from the steam plant, BPA would agree to deliver 1.4 kw to the purchaser's load centers.

Wheeling costs would vary from about 0.22 mills per kwhr for 230-kv delivery to the Puget Sound area to about 0.94 mills per kwhr for 12.5-kv delivery to Skamania County, Wash.

During May, June, and July, BPA would deliver to each purchaser 1,200 kwhr of surplus secondary energy for each basic kw. From August to April, each purchaser would arrange for the steam plant to generate 1,200 kwhr per basic kw for BPA's account. Purchasers would not be obligated to deliver if water conditions did not require steam generation, and could buy additional secondary energy from BPA at 1 mill per kwhr if available.

The PUD would sell its power under contracts which would give each purchaser a share of the plant's output in return for payment of a corresponding share of annual costs.

Atomic Progress

- Work starts again on redesigned Canadian reactor
- AEC moves to accept atomic insurance of two groups

• Two important design changes have been incorporated into Canada's first nuclear generating station, and construction is underway again at the Rolphton, Ont., site, after a lay-off of almost a year.

The 20-Mw(e) NPD (Nuclear Power Demonstration) reactor will have a different type of fuel vessel and a new method of charging and discharging fuel which permits fueling while the reactor is under full power.

The three partners in the project are Atomic Energy of Canada, Ltd., Canadian General Electric Co, Ltd., and the Hydro-Electric Power Commission of Ontario. They announced that work was to be resumed during the present summer. The reactor is now scheduled to go on the line in 1961.

Basic reactor system—the use of natural uranium for fuel and heavy water for moderator, pioneered at Chalk River—is unchanged.

The new fuel vessel is actually many small vessels. Instead of the vertical steel pressure tank originally planned, NPD will have a barrel-shaped, horizontal aluminum tank about 13 ft long and about 15 ft in diameter. Through the tank run 132 aluminum tubes into which are inserted zirconium alloy pressure tubes containing fuel rods and heavy-water coolant.

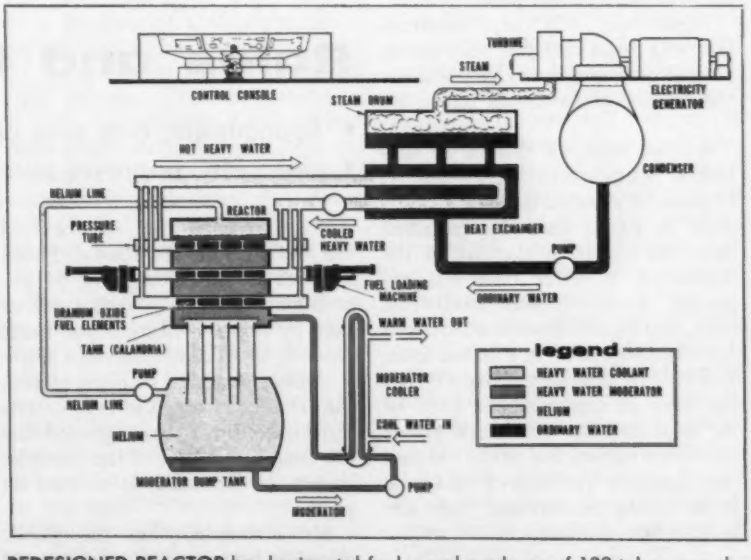
Coolant flows over the fuel rods, is heated, and travels to a heat exchanger where the heat is transferred to ordinary water to make steam. Coolant then recirculates.

Fueled from Both Ends

In the new fueling system, a remotely-operated fueling machine at each end of the reactor vessel permits loading and unloading of fuel rods from both ends.

This gives a more even distribution of fresh and partly-used fuel, permitting the most efficient use of the uranium and full power refueling.

The NPD station will serve as a pilot plant for stations with outputs of 150 to 300 Mw(e). Atomic Energy of Canada, Ltd., recently set up a nuclear power plant division in Toronto to produce a preliminary design for a 200-Mw atomic power plant division in



REDESIGNED REACTOR has horizontal fuel vessel made up of 132 tubes, may be refueled while it is operating under full power. Source: Ontario Hydro News

Toronto to produce a preliminary design for a 200-Mw atomic power station known as CANDU (Canadian Deuterium Uranium Reactor).

•The Atomic Energy Commission has served notice in the Federal Register that it intends to recognize policies of two atomic insurance groups as evidence of adequate protection against losses resulting from reactor accidents.

Under the Price-Anderson Indemnity Law of 1957, the government will indemnify reactor operators up to $500 million against public liability claims resulting from reactor accidents, provided they carry private insurance as well. Since 1957, AEC has been accepting the binders of the two groups, Nuclear Energy Liability Insurance Association and Mutual Atomic Energy Underwriters, on a provisional basis.

• Rural Cooperative Power Association broke ground last month for its reactor at Elk River, Minn.

• The Atomic Energy Commission is inviting architect-engineering firms to submit proposals for design studies on a heavy-water moderated reactor capable of operating on natural uranium fuel.

Proposals must be submitted by Sept. 29, and contract will require a final report by March 1, 1959. However, the commission says it is not committed to actual construction of a heavy-water power reactor.

Meanwhile, AEC says construction will begin late this year on an $8-million heavy-water components test reactor at Savannah River.

• More than six months of successful operation of the 16-Mw (t) Organic Moderated Reactor Experiment in Idaho have demonstrated that "the radiation stability of the terphenyls is better than was expected" from previous small-scale tests, said North American Aviation Vp Chauncey Starr in a recent letter to AEC. He pointed out that OMRE has been in service about 85% of the total possible time since power operation began, and predicted that "no significant problems would arise in increasing the core and plant size to 150 Mw of electrical output."

(*More Atomic Progress, page* 112)

U.S. Power Picture

- **Appalachian files on Smith Mountain hydro project**
- **Union Electric reconnoiters for pumped-storage site**

• Appalachian Power Co has filed application with the Federal Power Commission for a license to construct the proposed 320,000-kw Smith Mountain hydro project in Virginia.

Construction will start in a few months and will be completed in about three years. Cost, including two dams, generating facilities, transmission system connections, substations, and land, is estimated at $45 million.

• Union Electric Co is studying a site for a possible pumped-storage hydro plant in Reynolds County, Mo., George P. Gamble, operating vice president has revealed.

He said that company engineers have already looked at a number of sites elsewhere, but none has met requirements.

The company is acquiring such land or interests in land as may be needed for the investigation, Gamble added, and has retained Sverdrup & Parcel, engineers, to make geological and physical studies. Union Electric engineers will gather other data needed for a decision as to whether or not to go ahead with the project.

• Pacific Power & Light Co has purchased the transmission lines and facilities of Pan-American Petroleum Corp and Shannon Gas & Electric Co at the Salt Creek oil field north of Casper, Wyo.

Equipment purchased includes all transmission lines, equipment, and substations down to 440-v facilities in the field, the 57-kv line and facilities serving Pan-American's Casper refinery, and the repair shop at Pan-American's generating plant north of Midwest.

The Salt Creek generating plant is not included in the transaction. It is to be shut down as PP&L connects its transmission system into the oil field.

A Pan-American spokesman said his firm decided to sell the transmission facilities and shut down the plant for economic reasons.

• A development of more than 100 all-electric homes in Lombard, Ill., is among the first fruits of Commonwealth Edison Co's recently-established 1¾¢ electric heating rate. Each of the $21-25,000 homes in "Lombard Lilac Gardens" will be heated and cooled by a 3-ton central heat pump.

Rates and Regulation

- **Appointment, 6-yr term asked for Florida commissioners**
- **Idaho PUC approves purchase of gas facilities by WWP**

• A proposal that members of the Florida State Railroad & Public Utilities Commission serve by appointment of the governor rather than by popular election was made recently by its chairman, Alan Boyd.

Announcing that he plans to seek the change from the 1959 state legislature, Boyd also suggested that the four-year terms of the commissioners be extended to at least six years.

He contended that the public would be better served by appointed officials because the job is so complex that it takes a commissioner about two years to really know what he is doing. "He then spends the rest of the time worrying about whether he can be reelected," Boyd added.

• Idaho's Public Utility Commission has approved the sale of Cascade Natural Gas Co's distributing facilities in Lewiston to Washington Water Power Co for $1,250,000.

The commission said that WWP's proposed rates are 4% under those charged by Cascade.

Transit Follows Downhill Track

Street cars, trackless trolleys disappear in many cities, but there's still hope for electrified rapid transit

Cleveland Transit System will replace 60 electric trackless trolleys with diesel buses by Nov. 1. For Cleveland Electric Illuminating Co, the switch will mean a loss of about $400,000 in annual revenue.

Toledo & Eastern Railroad Co, an electric railroad with 12 miles of track between Clay City, Ohio, and Toledo, was recently permitted to go out of business. Reason: it was not making enough money.

Although the circumstances differ, much of the electrified transit industry finds itself on the same downhill track. Electric transit power load, as many utilities are ruefully aware, has been skidding downward since 1926. From a peak use in that year of 6.505 billion kwhr, sales gradually tapered off to 1.790 billion kwhr by 1956.

And there's no convincing evidence that this trend will be reversed. As cities become more crowded and parking places harder to find, conditions are ripening for a resurgence of mass transportation. But the sad fact is that electricity seems to be losing out to gasoline and diesel buses.

Of all the means of electrified transportation, only "rapid transit" (subway or surface track) holds much hope for continued healthy sales of electric power by utilities. The other electrified transit means—street cars and trolley buses—seem destined to go the way of the dinosaurs.

Many cities that formerly relied on streetcars have already abandoned them. Phoenix, Ariz., switched over to gasoline buses about ten years ago, and Salt Lake City went to diesel buses in 1946. Providence, R. I., whose citizens traveled in 196 trackless trolleys as late as 1945, now has an all-bus system. The last of the "TT's" left Providence streets in June 1955.

In Washington, D.C., eight streetcar routes still operate using about 65 million kwhr a year purchased from Potomac Electric Power Co. But the local transit company has been given until August, 1963 to end service on all street-car lines, and two of them may shut down this fall. The reason is not economic. It's just that the District feels that the street cars tie up traffic.

Even in cities that still maintain street car and trolley-bus lines, there's no evident inclination to expand them. Detroit's Dept of Street Railways still operates 99 trolley buses, but, says General Manager Leo J. Nowicki, "We will definitely not expand the operation or buy more as replacements."

Why not? Lack of flexibility is the main disadvantage. For example, Nowicki tells of a new shopping center half a mile from the end of one of the trolley lines that wanted service extended on a trial basis.

"It would have cost $20,000 for overhead wire to try the experiment," he says, "whereas buses could simply run out there to see what traffic there was."

Another disadvantage cited is that when there is trouble, all buses stop instead of just one. Trained crews must always be kept on standby, and for this reason, Detroit's trolley buses are only operated 40 hours a week.

"We are not enlarging our electrically-powered trolley fleet," said L. W. Tate, whose Dallas Transit Co now runs 80 trolley coaches in the Texas metropolis. "It remains to be seen whether we'll change to diesel or gasoline-driven buses. We will make that decision when it is time to replace the trolley coaches."

A few cities are still clinging to the trolleys. San Francisco likes its trolley buses because they are quiet and have plenty of torque to pull the city's steep hills. Los Angeles trolleys will probably be around for a long time because of their smoglessness. And where power is cheap, some cities simply can't afford to do without them.

Rapid Transit Is Still Popular

But the electric transportation means with the best future is rapid transit. It can carry more people, and it is faster than street travel. In Chicago a rapid transit railway was recently completed in the center of a busy expressway. New York has a link underway that will improve service between Brooklyn and Manhattan. Toronto, Ont., is planning an east-west subway to intersect its present north-south line.

For an additional 5% on right-of-way acquisition and minor expense for wider overpasses, the median-strip rapid transit line could help metropolitan areas solve some of their transit problems.

Boston has expanded its rapid transit system since World War II and is considering additional extensions along right-of-way owned by a steam railroad company. Cleveland's newest rapid transit line uses a railroad's right of way. Studies for improvements and additions to rapid transit are now underway in Washington, D. C., Camden, N. J., and the San Francisco Bay Area.

Utility Company Merger Motivates

Commonwealth Edison develops uniform, IBM recording of system interruptions throughout its seven divisions

G. G. BAILEY, Commonwealth Edison Co, Chicago, Ill.

The seven operating divisions, formed by the merging of several companies into the Commonwealth Edison Co, had each its own method of reporting and recording electric service interruptions. One group of operating people was not acquainted with and often didn't understand fully the reporting and recording methods of the others.

Nor had management any common basis for comparing the performance of the various divisions.

Accordingly, the development of a uniform system of reporting and evaluating service interruptions was assigned to a special committee, whose objectives were:

1. To develop a reporting system which would employ IBM equipment for recording all interruption data and to accomplish this at the least practicable cost.

2. To provide suitable summaries of such interruption information so that it would be useful to engineers and management in evaluating the quality of service, system design, operating procedures, and equipment performance.

Needs Surveyed

The committee called in representatives of the various departments to answer questions about their own activities and about what types of information they would consider useful to themselves. The reports prepared by the various divisions were reviewed carefully. Only reporting and recording procedures that were considered permanently useful were retained unless a marginal one could be combined with others.

The final decisions were accomodated to the number of people and departments involved.

Much of the committee's time and effort went into the development of the "Record of Interruptions," form shown here as Fig 1. To adapt the reporting and recording system to the use of IBM equipment, a coding scheme was developed and punch cards made. A form was also designed to enable field men to make maximum use of a check-off system of reporting interruptions.

The magnitude of the committee's task may be gauged by the fact that the original 62 items suggested for inclusion in the "Materials Affected" category were reduced to a mere 18.

The committee gave considerable attention to the reporting procedure, covering such matters as who was to make out the various reports and to whom the reports were to be sent. When these things had been determined, the job of selling began.

RECORD OF INTERRUPTION

TOWN OR COMMUNITY 5825 DATE 11-18-57

ADDRESS

LOCATION OF TROUBLE E. OF OAK S. OF BLOOMINGDALE

TIME OFF	MINUTES OFF	KVA INTERRUPTED URBAN	KVA INTERRUPTED RURAL	MVA - MINUTES URBAN	MVA - MINUTES RURAL
9:15 -2 PM	70	97		6.8	

SYSTEM AT FAULT

S. S. NO. D. C. NO.	1-
ESS NO.	2-
TRANS. LINE NO.	3-
FEEDER OR CIRC. NO.	4- 480.1
SECT. FUSE OR PTHD NO.	5-
RECLOSER NO.	6-
TRANSF. LOC. NO.	7-
SEC. OR SERVICE	8-
SERIES ST. LT. CIRC.	9-

PHASES INTERRUPTED: A X | B | C

VOLTAGE (KV): 4

CAUSE

	01 LIGHTNING
X	02 TREE CONTACT
	03 LIMB BROKEN ON LINE
	04 FOREIGN OBJECT ON LINE
	05 WIND
	06 ICE ON WIRES
	07 FOG
	08 WIRES CROSSED
	09 FIRE
	10 OVERLOAD
	11 DETERIORATION
	12 DEFECTIVE
	13 ACCIDENT BY OTHERS
	14 CUST. EQUIP.
	15 OPERATING ERROR
	16 PLANNED INT.
	17 OTHER

TYPE OF DAMAGE

X	1 WIRE DOWN
	2 BURN-OUT
	3 BROKEN
	4 OPEN
	5 BLOWN
	6 BURNED
	7 TRIP-OUT
	8 LOCK-OUT
	9 OTHER

MATERIAL AFFECTED

X	01 OVHD. COND.
	02 TRANSF. CONV.
	03 TRANSF. C.S.P.
	04 TRANSF.-DRY
	05 TRANSF.-AUTO
	06 UNGR. SYSTEM
	07 CABLE TERMINAL
	08 FUSE
	09 POLE
	10 INSULATOR
	11 GUY
	12 VALVE ARRESTER
	13 EXPULSION ARR.
	14 CUTOUT
	15 SWITCH OR DISCONN.
	16 RECLOSER
	17 REG. POLE MT.
	18 OTHER

CONDUCTOR COVER

	1 BARE
X	2 WEATHERPROOF
	3 PLASTIC
	4 TREE WIRE

CONDUCTOR TYPE

X	1 COPPER
	2 ALUMINUM
	3 A.C.S.R.
	4 COPPERWELD
	5 AERIAL CABLE
	6 SERVICE DROP CABLE

REMARKS:

FIG 1—**RECORD** of interruption shows information transferred from a somewhat similar form. The information has been coded for machine processing by IBM

Standardized Trouble Reports

RECORD OF INTERRUPTIONS

Division E Month of November 1957

TOWN COMM	DAY	TIME OFF		MIN OFF	KVA INT. URBAN	KVA INT. RURAL	MVA MIN. URBAN	MVA MIN. RURAL		SYSTEM AT FAULT		MAT AFF	TYPE DAM.	VOLTAGE	CAUSE	COND COV.	COND TYPE
5705	19	425	1	50	10		5		8	7807		1	7		8·	2	1
5705	19	425	1	50	10		5		8	14671		1	7		8·	2	1
2•					20		1	•									
5820	8	513	2	137	15		2		8	1768		1	7		2·	2	1
5820	8	618	2	102	25		25		4	430	1	1	1	4	2·	2	1
5820	8	620	2	40	53		21		4	430	1	1	1	4	3·	2	1
6•					123	35	106	11•									
5825	14	341	2	59		3		2	5	1223	1	11	1	4	15·	1	4
5825	18	915	2	70	97		68	4		480	1	1	1	4	2·	2	1
2•					97	3	68	2•									
5830	8	335	2	85	15		13		8	6640		1	7		8·	2	1
5830	13	530	1	80	10		8		4	325	1	1	1	4	3·	2	1
5830	18	555	2	86	500		431		5	2822	1	18	1	4	11·	2	1
5830	19	714	1	61	5		3		8	8493		1	5		8·	2	1
5830	21	730	2	53	15		8		8	6641		3	7		17·		
5830	27	1131	1	41		322		132	5	2314		1	1	4	15·	1	1
6•					545	322	463	132•									
5845	18	1100	2	55	10		5		8	5785	1	1	1		2·	2	1
1•					10		5	•									
23					1200	425	876	177									

FIG 2—SUMMARIZING by code and IBM equipment begins with this form where such information is given by service area division. The number of interruptions, their durations and effects and circumstances constitute a local history

RECORD OF INTERRUPTIONS

	Annual Totals 1957		1st Quarter 1957		2nd Quarter 1957		3rd Quarter 1957		4th Quarter 1957		1st Quarter 1958	
	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.
DIVISION A	16.6	54	12.1	30	11.6	35	33.4	78	9.1	20		
DIVISION B	11.8	81	6.8	71	13.6	43	20.3	119	6.4	47		
DIVISION C	17.1	67	5.4	41	19.3	49	36.1	86	7.7	40		
DIVISION D	64.1	64	48.1	46	68.5	45	78.7	91	61.0	65		
DIVISION E	51.8	79	33.9	39	28.9	86	119.6	96	24.8	46		
DIVISION F	91.1	75	49.2	61	171.7	43	82.6	175	60.9	40		
DIVISION G	110.9	55	100.3	52	88.1	71	197.7	49	57.8	56		
TOTAL COMPANY	37.6	70	23.9	49	42.9	50	60.5	100	23.3	48		

Explanation:

Frequency - The percentage of distribution transformer* capacity interrupted. (projected annual basis)

Duration - The weighted average length of interruption in minutes of the transformer capacity interrupted.

* For the purpose of reporting interruptions of service to customers a distribution transformer shall be considered as any transformer that serves a customer directly, regardless of either the primary or secondary voltage.

FIG 3—INTERRUPTIONS on Commonwealth Edison system are recorded on a quarterly basis in a manner that permits easy comparison of the frequency and duration of trouble in the various divisions. The text defines these criteria

First, the plan was explained, step by step, to division operating superintendents; then to division vice presidents, commercial department heads, and company managers. Finally, it was presented to the vice president in charge of operations, the executive vice president, and the president. All approved. The committee now had the green light to proceed with putting the plan into effect.

A trial run of the new reporting and recording system was made during December 1956, although the old system was continued in use to complete the data for the year. The trial was successful, and the new method of reporting and recording interruptions went into effect on a company-wide basis on Jan. 1, 1957.

An actual service interruption has been recorded on the form in Fig 1. A troubleman has been noti-

SYSTEM INTERRUPTION SUMMARY BY DIVISION AND PORTION OF SYSTEM AT FAULT

ANNUAL
1957

	Substation or Distribution Center		Electric Service Station		Transmission		Distribution		Transformer Secondary or Service		Totals	
	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.	Freq.	Dur.
DIVISION A			.0	9	.9	192	14.5	44	1.2	70	16.6	54
DIVISION B	1.4	22	1.4	89	.5	522	7.8	58	.6	92	11.8	81
DIVISION C	.2	26	.0	40	3.6	53	12.3	64	1.1	151	17.1	67
DIVISION D	4.9	43	.6	113	25.8	38	31.7	86	1.2	97	64.1	64
DIVISION E	.0	98	4.3	24	24.2	37	22.1	134	1.1	131	51.8	79
DIVISION F	23.3	10	5.0	52	21.5	35	25.3	145	2.4	206	91.1	75
DIVISION G	16.4	31	1.3	19	36.3	22	53.7	84	3.2	67	110.9	55
TOTAL COMPANY	4.1	19	1.6	50	11.1	43	19.5	94	1.2	129	37.6	70

FIG 4—PART of system susceptible to or causing interruptions over the period of a year is pinpointed in this summation which serves notice to the utility of the need of maintenance and/or construction sooner or later

RECORD OF INTERRUPTIONS BY CAUSE

DIVISION A ANNUAL 1957

SYSTEM AT FAULT		TRANSMISSION		DISTRIBUTION		TRANSFORMER SECONDARY OR SERVICE		TOTALS	
CAUSE	CODE	FREQ.	DUR.	FREQ.	DUR.	FREQ.	DUR.	FREQ.	DUR.
Lightning	01			1.3	115	.4	115	1.8	115
Tree Contact	02			1.6	40	.0	31	1.6	40
Limb Broken on Line	03			1.0	36	.0	45	1.0	36
Foreign Object on Line	04			.1	29			.1	29
Wind	05			.2	38	.0	46	.2	38
Ice on Wires	06								
Fog	07								
Wires Crossed	08								
Fire	09			1.0	25	.0	44	1.0	25
Overload	10			.4	5	.1	28	.5	9
Deterioration	11			.6	32	.2	57	.8	38
Defective	12					.1	42	.1	42
Accident By Others	13			.1	48	.0	76	.1	.56
Customer Equipment	14			.0	109	.2	37	.2	51
Operating Error	15								
Planned Interruption	16								
Other	17	.9	192	2.3	27	.1	40	3.4	73
Underground System	50			5.7	44			5.7	44
TOTALS		.9	192	14.5	44	1.2	70	16.6	54
Substation or Distribution Center									
Electric Service Station								.0	9
TOTAL FOR DIVISION								16.6	54

FIG 5—NEW UNIFORM RECORDING facilitates many kinds of studies, such as this pertaining to the causes of system interruptions in one or several divisions

fied by radio that a customer at 403 S. Oak Street, Maple City, had reported "no lights" and that he had seen a large flash. After restoring service, the troubleman reported the conditions he had found, the work he had performed, the time service was restored. His notations were made on a "Customer Ticket."

This document noted also that the trouble occurred on A phase of Feeder 480, that the feeder's voltage was 4 kv, and that the material affected was an overhead conductor. He gave the cause of the interruption as a tree contact and described the damage as a wire down. He reported also that the conductor was of copper and was weatherproofed.

The form on which he recorded these facts was sent to the office at the end of the working day. In the machine accounting department, the information was transcribed on the "Record of Interruption" and coded for IBM processing.

In the coding scheme on this form, the number 5825 signifies the division and the town or community where the interruption occurred. The 5000 represents Division E; the 800, Willow district; the 25, Maple City. The four-digit number appears again when the data have been transferred to the "Monthly Record of Interruptions," shown as Fig 2. The latter report is available some 10 days after the end of each month.

This monthly runoff contains much valuable information on what happens in a part of the company's service area. For example, just under the heavy line are two other instances of trouble in Maple City during the month, and the effects of these interruptions can be read across the page.

Totals at the bottom of the sheet show that the same division had 23 interruptions in that month.

Coded information comparing the performance of various divisions is contained in the form shown as Fig 3, a report that comes out quarterly. The example in the illustration happens to be the annual report covering the four quarters of 1957. The interruptions are reported in terms of frequency and duration.

As used in the new system of reporting interruptions, frequency is that percentage of distribution transformer capacity interrupted. It is projected on an annual basis. The distribution transformer is any unit serving a customer directly, regardless of the primary or secondary voltage. Duration, as employed in some of these reports, is the weighted average length of interruption in minutes of the transformer capacity interrupted.

Some figures in Fig 3 reflect the terrific flood and storm which struck Illinois on July 11 and 12. Reference to the third quarter figures shows the effects of the storm. In the company's view, an interruption report should show how the system performs in all weather.

RECORD OF INTERRUPTIONS BY MATERIAL AFFECTED

DIVISION A — ANNUAL 1957

SYSTEM AT FAULT		TRANSMISSION		DISTRIBUTION		TRANSFORMER SECONDARY OR SERVICE		TOTALS	
MATERIAL AFFECTED	CODE	FREQ.	DUR.	FREQ.	DUR.	FREQ.	DUR.	FREQ.	DUR.
Ovhd. Cond.	01			4.3	54	.0	55	4.3	54
Transf. Conv.	02					.3	94	.3	94
Transf. C.S.P.	03					.0	49	.0	49
Transf.-Dry	04								
Transf.-Auto	05								
Ungr. System	06			5.7	44			5.7	44
Cable Terminal	07	.9	192	2.2	51	.0	85	3.1	93
Fuse	08			.2	8	.8	65	1.0	52
Pole	09					.0	90	.0	90
Insulator	10					.0	76	.0	76
Guy	11								
Valve Arrester	12			.2	4			.2	4
Expulsion Arr.	13								
Cutout	14					.1	40	.1	40
Switch or Disconn.	15								
Recloser	16								
Reg. Pole Mt.	17								
Other	18			1.9	21			1.9	21
TOTALS		.9	192	14.5	44	1.2	70	16.6	54
Substation or Distribution Center Electric Service Station								.0	9
TOTAL FOR DIVISION								16.6	54

FIG 6—MATERIALS AFFECTED by an interruption are often information basic to utility's planning for continuing maintenance and also for future construction

The "System Interruption Summary by Divisions and Portion of System at Fault," shown as Fig 4, is an annual report. Summarizing interruptions according to substation or distribution center electric service station, transmission, distribution, and transformer secondary or service, it gives a quickly grasped indication of where interruptions are experienced on a system or distribution center electric quency and duration, are used here too as defined above.

The annual "Record of Interruptions by Cause" for overhead transmission and distribution in Division A, as shown in Fig 5, summarizes the causes of interruptions by parts of the overhead system. The classifications, "Substation or Distribution Center" and Electric Service Station" are set up in a separate part of the form because the causes of interruptions listed do not apply generally to these segments.

This report is made up for each of the seven divisions of the company's service area.

Another report is made up for each of the seven divisions. As shown in Fig 6, it summarizes interruptions with respect to the materials affected. Again, the materials listed, in general, do not apply to substation or distribution center.

The new system of reporting interruptions has been in use only a year. Yet some important observations may be made, such as:

1. Monthly, quarterly, and annual reports are issued much faster.

2. The new system saves about $7,500 per year in preparation time.

3. By using IBM equipment, 8 hr of one man's time on the machine is required for preparation of the complete summary which covers all interruptions for one year.

4. Individual tabulation of interruptions by feeder, portions of a circuit, or any combination, may be had for the asking. The number of different types of studies is limited only by items on the report form.

5. Perhaps the most important benefit has been the standardization of reporting interruptions throughout the system and the ability to compare the performance of the divisions rapidly and accurately.

Many possibilities for conducting special studies have yet to be explored. Such studies could deal with equipment and material performance, system design, tree-trimming programs, and construction and maintenance expenditures.

Standards Help Meet New Loads

Standardization implements volume production of medium transformers and prepares utilities for future growth

G. P. VEST, Manager-Marketing, Medium Transformer Department, General Electric Co, Rome, Ga.

The electrical industry faced two choices 20 years ago, when the demand for medium transformers began to tax the facilities for supplying them. It could expand those facilities, or it could standardize the product in demand. Events have proved that the latter choice was most fortunate, as it has had an enduring effect. Not only did it enable increased production, but it has had considerable effect in reducing first cost, distribution costs, and installed costs.

This decision of the industry produced American Standards covering almost all transformers in the 501 to 10,000-kva range, 69-kv and below. With the phenomenal growth expected in the use of electricity over the next 20 years, it is important that the impact of today's standardization be realized and to stress the need for continually improving this standardization and the ability to apply it.

The need for standardization of medium-size transformers was not urgent until the country's electrical requirements necessitated volume production. But by 1943 the industry required about $20 million worth of transformers in the 501-through-10,000-kva range. Users and manufacturers could no longer meet customer demand with custom-built apparatus, and the need for some standardization to obtain volume production was apparent.

In 1943 General Electric Co announced a line of RM (Repetitive Manufacture) transformers in these sizes. Published ratings and characteristics were based on a brief history of transformer buying. To launch the program, a nominal price advantage of about 6% over special equipment and savings in shipping time were advertised.

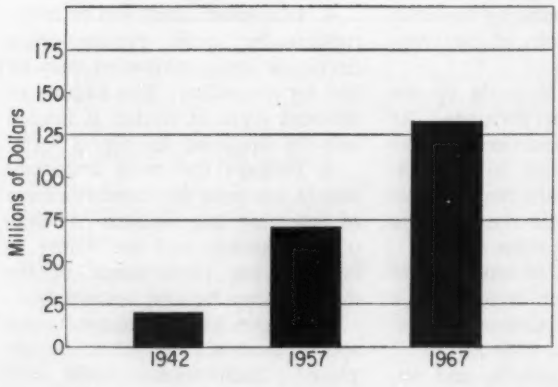
Users Prompt Changes

In the next six years changes were made by all manufacturers as transformer users began to standardize on features which they had found desirable in their growing business. The volume of medium-size transformers was expanding so rapidly that by 1949 the American Standards Association took an interest in this particular capital goods area. After two years of intensive study, an ASA committee came up with the first complete industry standard and published ASA Standard C57.12A, covering 3-phase and single-phase medium-size transformers.

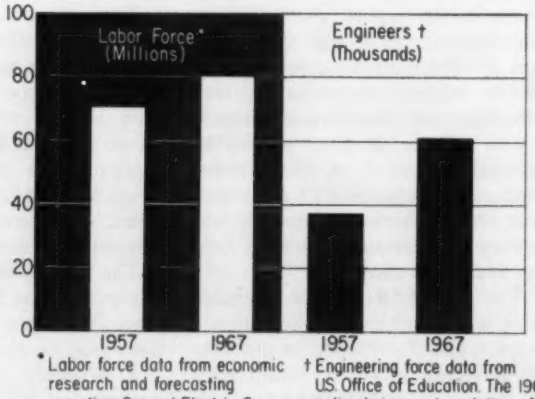
The electrical industry's $20 million requirement in medium transformers had by then passed $50 million. The manufacturers were facing difficulty in acquiring enough facilities and people to handle the demand, and users were not much better equipped with engineering personnel for handling all the custom-built transformer details and specifications that had characterized the medium-size transformer business in the early 1940's.

The ASA Standard C57.12A covered about 80% of the medium-transformer range. In 1956 the ASA completed a second project of standardization and for trial acceptance introduced ASA C57, Section 30, pertaining to medium transformers with load tap changing. This, in effect, gave relatively complete coverage for all transformers in the 501-through-10,000-kva range.

Before establishment of either standard, manufacturers and utilities had to plan and lay out factory facilities for innumerable ratings and accessories. The standards cut down such items to about 10,000, and engineers were able to give more professional attention to plan-



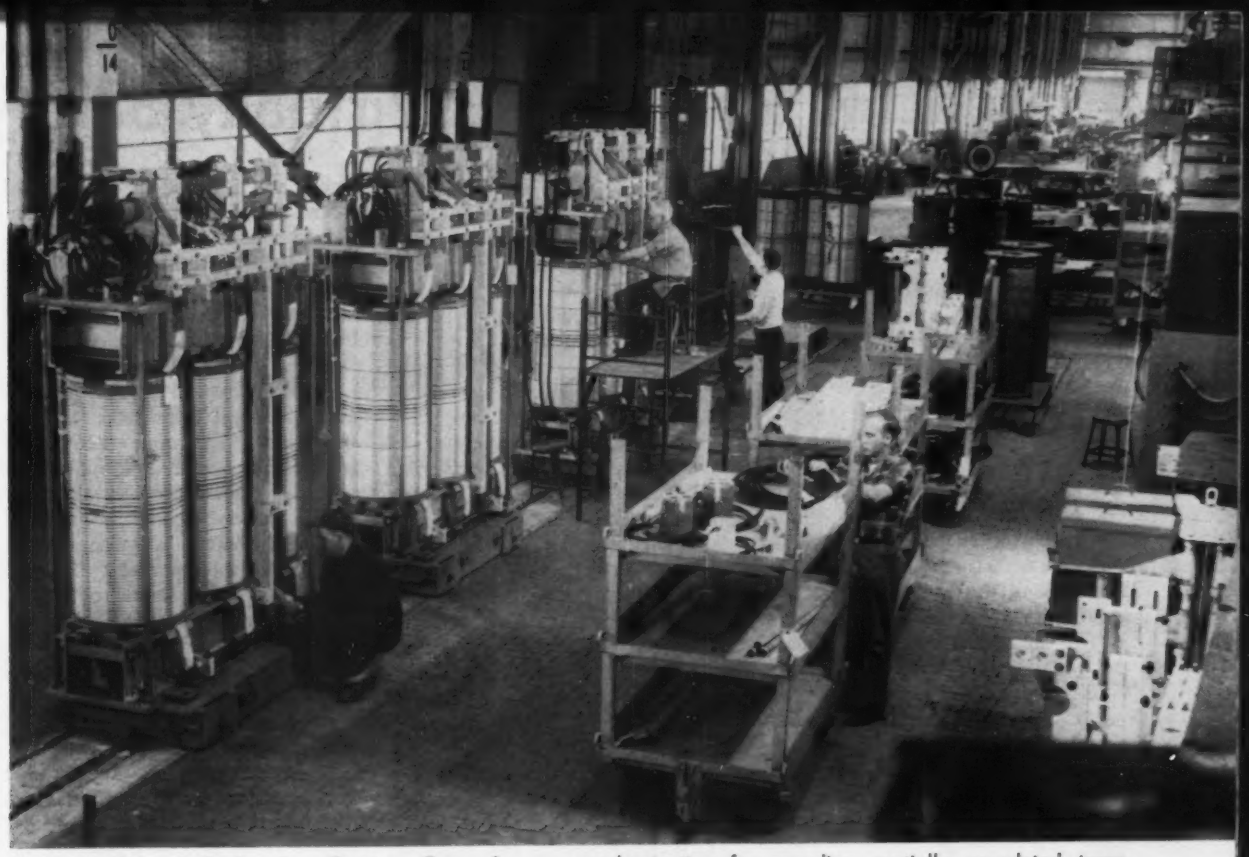
DEMAND for medium transformers is expected to exceed $140 million in 1967 on the basis of today's trends but proportionately fewer engineers may be available



* Labor force data from economic research and forecasting operation, General Electric Co.

† Engineering force data from US. Office of Education. The 1967 estimate is an extrapolation of published figures through 1965

MANPOWER in electrical industry is not increasing at a rate sufficient to satisfy needs for handling 1967 loads



AUTOMATION is looked to for offsetting effects of manpower insufficiency in 1967. Photo shows advances in mechanization for speeding partially completed transformers through the many production stages at present

ning for the industry's expansion.

On the basis of a manufacturer's standard, a nominal price advantage of 6% was offered in 1943, and shipments were made available in some ten to 12 weeks. Later, after completion of the American Standard, this price reduction was increased to 8%. The reductions in price and shipping time came through the volume business resulting from standardization in combination with the growing demand of the utility industry. Manufacturers responded to this encouragement by investing more money in medium-size transformers as a distinct business.

Thus, one major manufacturer in 1957 was operating a special facility, equipped with the highest degree of mechanization for such manufacture, instead of the old one built basically for handling large power transformers. This facility makes practicable transformer shipment in six to seven weeks and affords an 8% price advantage on the standardized units.

Users' requirements for medium transformers in 1957 were about $70 million. If present utility trends continue for the next decade—which appears likely—total demand by 1967 should be $140 million. With this doubling of demand, assuming that the character of the business remains what it is today, engineers involved with such equipment and workers producing the goods in the factory should about double.

Computers to Help

Yet analyses of today's personnel figures give no assurance that ten years hence such personnel will be available in such numbers. Present statistics, in fact, indicate that by 1967 this labor force will have increased only 13%. On the basis of today's statistics on engineering manpower and engineering school matriculations, the maximum expectable increase in engineering personnel by 1967 will be 70%. This percentage is subject to obvious reductions, such as by death and acceptance of non-technical occupations. Furthermore, a severe drain will be placed on this manpower pool by the requirements of such growth industries as plastics and electronics.

These figures tend to indicate that utilities and manufacturers might be handicapped in meeting the growing industrial and residential demand. But the situation has another aspect: The lack of engineering talent need not be a bottleneck. It can be countered to some degree by tremendous advancement in the use of electronic computers. Manufacturers can offset the effects of their manpower scarcity on the factory floors through the application of automation. Utilities need not be circumscribed in their operational activities when equipment needs only repetitive maintenance rather than particular attention for each item of equipment from each individual manufacturer.

As in the past, the common denominator is standardization of the product itself. It is essential that both supplier and user work as a team toward improving today's standard and the industry's ability to use it.

Reactor Research Is Virtually Safety

Designers from the beginning asked themselves: Is it safe? AEC demands control of released fission products

HOWARD G. HEMBREE and
JAY J. DAVENPORT, Reactor Safety Section, Engineering Development Branch, Division of Reactor Development, Atomic Energy Commission, Washington, D. C.

The likelihood of a reactor explosion on the scale of a nuclear detonation is very small, even were all nuclear safety devices to fail simultaneously. In such an improbable circumstance, the release of fission products to the atmosphere is the chief hazard.

This hazard is potentially greatest for power reactors since this type operates for long irradiation periods at high power levels and thereby accumulates large quantities of fission products. Accordingly, the provisions for the safety and integrity of power reactors are most complex and offer challenging problems to the reactor designer and operator.

Since the earliest days of nuclear reactor development in this country reactor designers have constantly exercised responsibility toward public health and safety. Each reactor project, civilian or military, has been reviewed closely, the primary question being: Is it safe? Thus, the entire reactor development program in essence has been and remains a safety program.

The reactor operating record in the United States reflects this concern for safety. In over 15 years of nuclear reactor operations there have been no accidents, involving a regular operating reactor, which have harmed persons on or off the reactor site.

Such a record doesn't just happen. The philosophy of reactor design stresses the incorporation of inherent and built-in safety features to minimize the possibility of a runaway. Whenever possible, the negative temperature coefficient of reactivity is used so that excessive heat tends to reduce a neutron efficiency, thereby automatically shutting down the nuclear reaction. Inherent safety features are reinforced by control instruments and mechanisms. But should a nuclear incident occur despite these precautions, the reactor pressure vessel and the building housing the reactor are designed to "contain" its effects.

The Atomic Energy Act of 1954 requires publication in the Federal Register of regulations governing the licensing, construction, design, and operation of reactors. These regulations place responsibility for the reactor's safety upon the licensee who, as an applicant for such license, must prepare a detailed hazard analysis of the proposed unit. AEC reviews in detail the design specifications and proposed operating procedures. A prerequisite for a license is the submission of a hazards summary report, including:

License Requirements

1. A description of the facility in sufficient detail to permit an evaluation of the adequacy of means proposed for minimizing the probability of danger from radioactivity to persons on and off the site.

2. A description of the reactor site and surrounding land (agricultural, commercial, industrial, residential, etc.), and the meteorological, hydrological, geological, and seismological data for evaluating the measures for protecting the public against possible radioactive hazards.

3. A description of proposed procedures for operations, startup and shutdown, maintenance, storage, training employees, minimizing operational mishaps, investigating unusual incidents, etc.

4. A description of the relationships among operational features, protective devices, and pertinent features of the site to such circumstances as operational mistakes, equipment or instrument failure or malfunction, fire, electric power failure, earthquake, storm, strike, and riot.

An operating license is granted only after an exhaustive review of all of these factors.

The nuclear reactor safety program could be fittingly summarized in the following way: Nuclear reactors are designed in every detail for safe and dependable operation. Before a construction permit or license for operating a reactor is granted by the government, a hazard evaluation is made by the Atomic Energy Commission reviewing the technical details of the design. Before initial operation, and periodically thereafter, reactors are inspected by AEC representatives. In addition, the Commission sponsors extensive research and development on all major aspects of reactor safety. A vigorous program is being conducted in these areas:

1. Reactor transient problems.
2. Chemical problems related to reactors.
3. Containment of reactor systems.
4. Engineering problems dealing with safety of reactor systems.
5. Problems specifically related to fast reactor safety. The remainder of this article is devoted to the experimental programs which are directed toward improving reactor safety in design and operation.

Several thermal reactors have been or are being built primarily for investigating transient conditions. Reactor transients can arise as a result of temperature and power changes during normally steady-state operating conditions. Temperature and power changes may result from excess reactivity induced by control rod action, sudden creation of voids in the moderator, sudden removal of irradiation containers, failure of coolant flow, or abrupt changes in coolant temperatures.

Thermal reactor facilities include the SPERT (Special Power Excursion Reactor Test) series conducted by Phillips Petroleum Co at the National Reactor Testing Station, Arco, Idaho, and the KEWB (Kinetic Experiment on Water Boilers) reactor experiments conducted by Atomics International near Los Angeles, Calif.

SPERT-I is an unpressurized, light-water-moderated, tank-type reactor, using aluminum-uranium (MTR type) fuel. It has been in operation since July, 1955. Studies are made in which the input reactivity is varied in discrete increments (step function) or as a linear function

Program

(ramp) with time. Such tests enable study of reactor power level vs time and reveal the range of inherent operating stability under a wide variety of conditions.

SPERT-II will be a 300-psi, 400F heterogeneous reactor employed chiefly for studying the effect of various moderators and reflectors on transient behavior. Both light and heavy-water tests are planned. Designed in detail, this reactor is being built for 1959 critical operation.

SPERT-III will be a 2,500-psi, 668F, heterogeneous reactor for studying transient characteristics in power reactors. Data obtained will be directly applicable to power and propulsion reactors based on the pressurized-water concept. Construction is nearing completion.

Among tests planned for SPERT-III are "blind startup" (no nuclear instrumentation in the sub-power region), "cold water" accident (operation on one coolant loop followed by sudden switching to a second loop at a lower water temperature), and other excursion type testing induced by either loss of flow or sudden changes in reactivity.

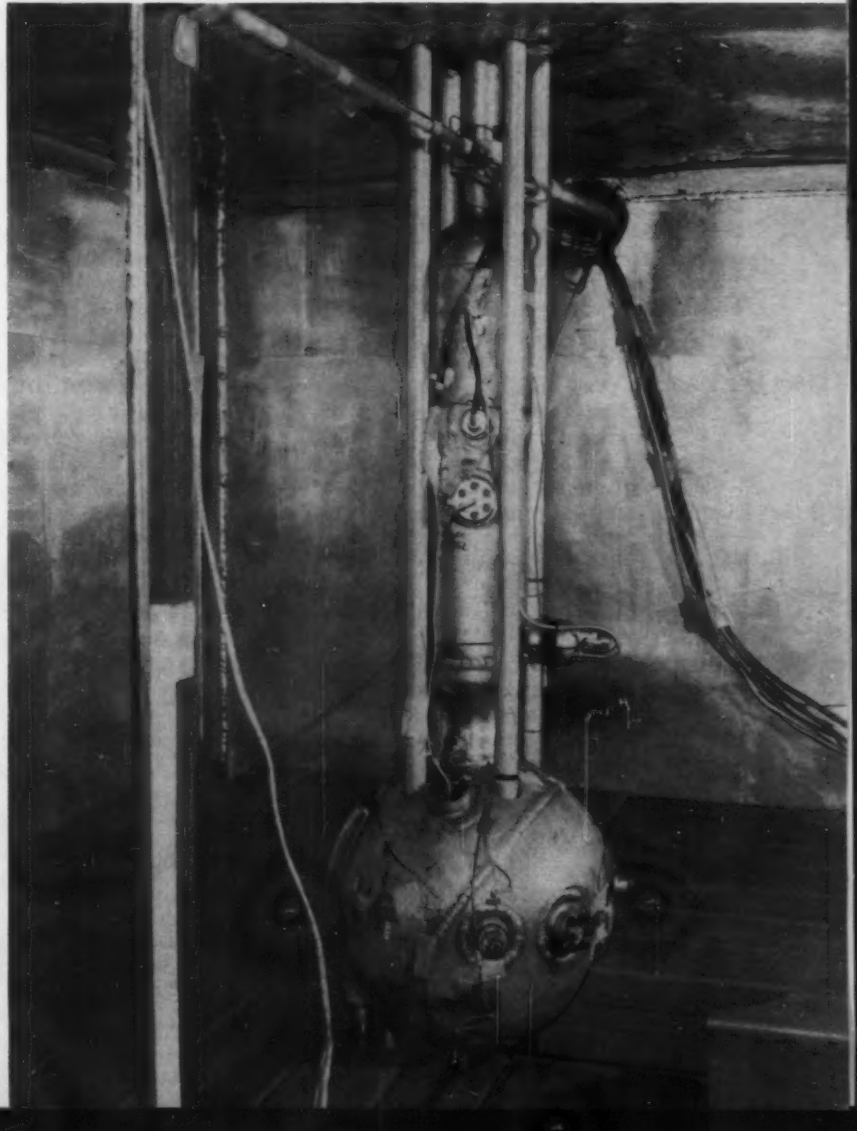
KEWB, a spherical-core, graphite-reflected, liquid-fuel reactor rated at 50 kw, has been operating since July 1956 in the Santa Susana Mountains near Los Angeles. It was designed to obtain data which will lead to safer homogeneous reactors. Results thus far indicate that the basic mechanism for shutdown in a water boiler reactor is radiolytic gas formation.

Theoretically, chemical energy liberated from a potential metal-water reaction could exceed by far the nuclear energy released in a reactor runaway. Such an accident could burst the reactor vessel and disperse radioactive material to the surroundings. Therefore, the nature and mechanism of molten metal-water reactions is being investigated. Metals under study include aluminum, zirconium, uranium, sodium-potassium alloy, and stainless steel.

The Engineering Research Laboratories of Columbia University has conducted research into the integrity of fuel elements under fast transient conditions, using an electrical technique to cause rapid heat-

KEWB SITE in Santa Susana Mountains of California carries on experiments to obtain data for the design of safer homogeneous reactors. Unit rated 50 kw

KEWB-1 is a special-core, graphite-reflected, liquid-fuel reactor. Results obtained indicate basic mechanism for shutdown is radiolytic gas formation



ing and vaporization of simulated fuel elements. Steam explosions are produced which, in the tests on zirconium, are followed by evidence of a metal-water reaction.

An experimental group at the Aerojet General Corp has studied the effect of controlled metal temperature and particle size distribution on the percentage of reaction. This study indicated that metal-water reaction rates are slower than high explosive reactions, taking milliseconds rather than microseconds to attain peak pressures. This factor is of basic importance in containment vessel design.

A more basic explanation of the fundamental reaction mechanism between molten metal and water is being sought by a group at the Argonne National Laboratory. Another study at the General Electric Co's Vallecitos Atomic Laboratory is investigating the basic chemistry for the reaction, conducting theoretical analyses, and applying results to reactor conditions. These programs have very recently been started.

Ignitions Studied

A study of the circumstances of spontaneous ignitions of zirconium, uranium, thorium, and other metals has not indicated a definite cause. Such ignitions occur sometimes in massive metal and, although an out-of-pile phenomenon, have direct bearing on the fabrication and reprocessing of fuel element materials. The ignition's mechanism is closely related to that of metal-water reactions. This experimental program is also being conducted at the Argonne National Laboratory. It is a fundamental investigation of the complex metal-gas reaction problem taking into account such variables as temperature, metal purity, gas pressure, metallurgical history, gas composition, and type of oxide film formed.

In a metal-water reaction concurrent with a breach of reactor containment, radioactive fission products conceivably could be released under pressure into the atmosphere and dispersed into the environment. This combination of circumstances, though highly improbable, must be considered. For this reason volatilization of fission products through the melting of reactor fuel plates is under study. Experiments in the controlled melting of irradiated fuel specimens have shown that prolonged heating in air at temperatures above the melting point results mainly in the partial volatization of the rare gases, the halides, iodine and bromine, and the alkali metals, cesium and rubidium.

Reactor containment is the final safeguard. Some reactors are within a steel shell built to contain a possible blast and any fission products thus released. Many of these gas-tight steel containers are lined with concrete to stop flying fragments. A study at the Naval Ordnance Laboratory, White Oak, Md., seeks basic information on the optimum reactor pressure vessel designs. The structural response of water-filled, mild steel and stainless steel cylinders to internal static and dynamic loading is under study.

Experiments are underway on outer, or vapor containment shells at the Ballistics Research Laboratory, Aberdeen Proving Ground, Md. These tests subject vessels 2½, 5, 10, and 20 ft in dia to shock waves induced by carefully selected explosives and propellants and seek to establish scaling laws applicable to full-size vapor containment shells.

Fuses Considered

The containment of high-velocity fragments produced by an explosion is under study at Stanford Research Laboratory, Menlo Park, Calif. Penetration of target materials by fragments of different character, size, and velocities is studied. An experimental program investigating construction materials is in progress at Armour Research Foundation, Chicago, Ill., where the crushing strength determinations of various high-density concrete mixtures are being made. Tests are conducted on proposed shock wave absorbing materials to select those most suitable for blast shield application.

Atomics International in its work on reactor fuses at Canoga Park, Calif., is seeking to develop a further line of defense in the event all other safety devices fail. Research reactors appear to be adaptable to the use of fuses, and development is pointed toward using a vacant fuel element or reflector element space for the fuse.

The idea behind the fuse is to store a reactor poison, such as BF_3, in the mechanism above the core. This poison will be released automatically into a fuse receiving chamber designed to fit into the vacant space and thus shut down the reactor when the power level is too high or a power excursion occurs. Such fuses must be extremely fast, reliable, and not subject to false scrams or small variations in power level; they should be proof against earthquake, tampering, and should "fail safe."

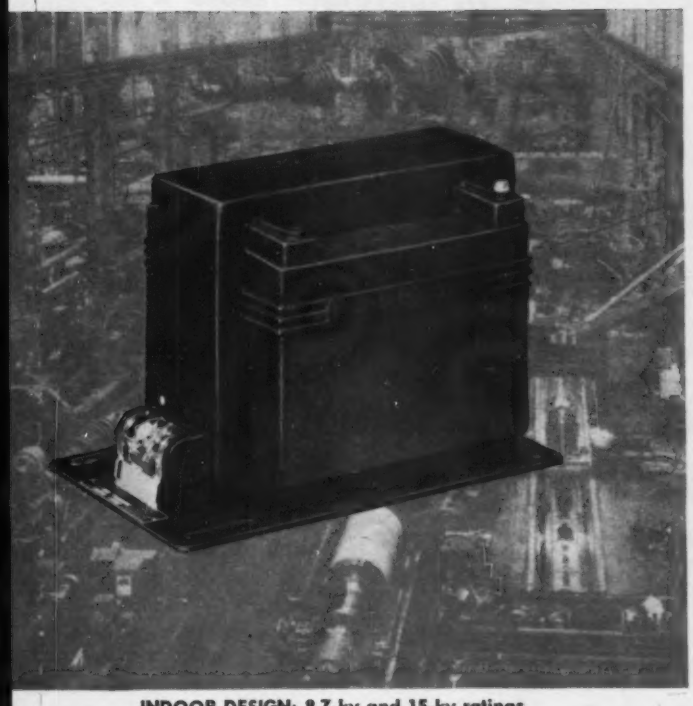
Work is progressing also on fuses for power reactors. Although their general operating principle is the same as that for fuses for a research reactor, they are more difficult to develop because of the more severe temperature and pressure conditions.

Meltdown a Problem

A distinct class of safety experiments involves fast-fission reactors, whose behavior under normal and transient conditions has been studied in tests over several years at Los Alamos and Argonne. The Experimental Breeder Reactor I (EBR-I) at the National Reactor Testing Station in Idaho, one of the first fast reactors in the country, resumed operation recently with a third core. EBR-I will now be devoted exclusively to experiments in reactor safety. It was built originally to demonstrate the feasibility of breeding fissionable material, to study the physics of reactors in the high-energy neutron range, and to provide experience with liquid-metal coolants.

One of the central problems in fast reactor safety is that of core meltdown and the possibility that the molten material will be reassembled into a critical configuration in the bottom of the reactor vessel. In order to study this complex problem a special reactor, designated the Transient Reactor Test Experiment (TREAT), is being built by Argonne National Laboratory at the National Reactor Testing Station in Idaho. Basically TREAT is designed so that a sample fuel element can be heated beyond its melting temperature without overheating the reactor itself. The TREAT facility will be a versatile testing reactor for thermal fuel element studies, fission product release studies, and in-pile metal-water reaction studies as well as other reactor safety investigations.

NEW



INDOOR DESIGN: 8.7-kv and 15-kv ratings

OUTDOOR DESIGN: 8.7-kv and 15-kv ratings

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General Electric announces...

PROJECT EHV

An operating system for study of all aspects of extra-high-voltage transmission 460 to 750 kv

General Electric, with counsel from the electric utility industry, will build and operate a prototype EHV transmission system. Objectives are to help extend the electrical industry's knowledge of high-voltage phenomena and to anticipate the equipment that will be needed when EHV transmission becomes standard practice.

The line, 4½ miles in length, will parallel and be made a part of the Pittsfield-Lee portion of the Western Massachusetts Electric Company's system. Initial operation in early 1960 will be at 460 to 500 kv a-c, rising later to the 600- to 750-kv range. In 1961, as tests proceed at the 650-kv level, power will be diverted from the adjacent segment of the WMECO line through the EHV system.

Others co-operating in the project, in addition to Western Massachusetts Electric Company, are Stone & Webster Engineering Corporation, Aluminum Company of America, and American Bridge Division of United States Steel.

An Advisory Council representing electric utilities, will help determine exact project parameters and the nature and scope of research.

Expected areas of study include:

- Economics of various a-c super-voltages
- Lightning and switching surge performance
- Effects of conductor size, bundle and phase configuration.
- Mechanical performance of line
- Effect of conductor temperature
- Corona loss, radio and television interference
- Reduced basic impulse insulation levels

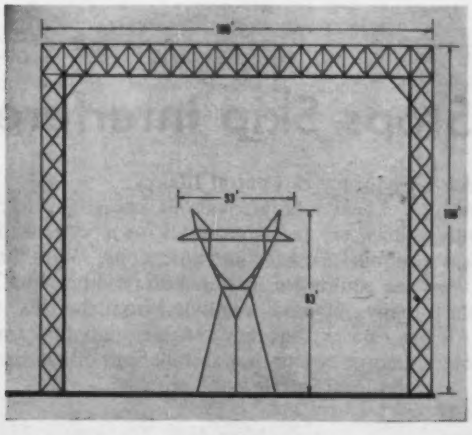
A wide variety of measurements with 200 instruments will be made at 15-minute intervals during all tests. Data will be processed through the 705 electronic data-processing machine at General Electric's Power Transformer Department, which is co-ordinating the project. Data will be correlated by analytical studies, model investigations and laboratory research in many G-E Departments.

For further information on PROJECT EHV, contact your G-E Representative or write for bulletin GED-3262, General Electric Co., Section 421-56, Schenectady 5, N. Y.

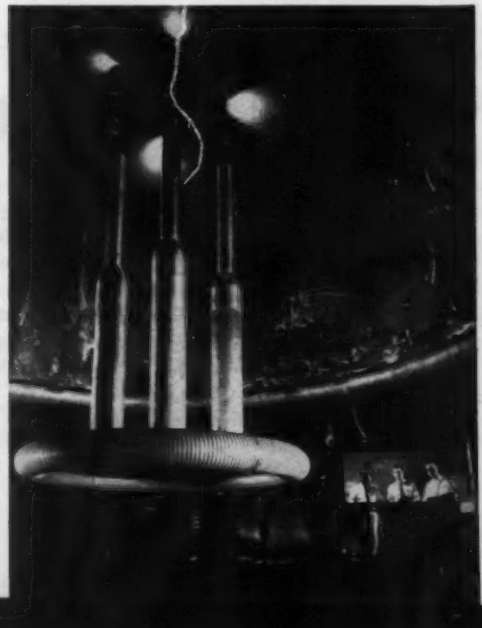
Progress Is Our Most Important Product

GENERAL ELECTRIC

PROJECT EHV portal-type towers, 138 feet high, 180 feet wide (here contrasted with typical present 230-kv towers), will allow varied conductor spacings and clearances.



PRELIMINARY STUDIES of apparatus and system are now under way. Here sample conductor bundle is tested for radio interference at G.E.'s Pittsfield High Voltage Laboratory.



New Synthetic Replaces Rubber in Bearings

LLOYD McWILLIAMS, Maintenance Supervisor, Shawinigan Water & Power Co, Shawinigan, Quebec

Substantial savings in relining guide bearings of water turbines can be made by using a bonded phenolic resin instead of rubber or lignum vitae. Up to $3,000 may be saved in a single relining operation.

The adaptation to resinous plastic from lignum vitae is quite simple. Plastic sheet of the proper thickness is cut into wedge-shaped pieces and driven into the dove-tailed slots around the inside diameter of the shell.

The conversion of a rubber-lined bearing is a somewhat different problem. All rubber is removed from the inside of the shell. The shell is clamped, set up on a boring mill, and machined slightly beyond the rubber depth to assure a perfect cylindrical form. The shell is drilled and tapped for countersunk, corrosion-resistant, flat-head machine screws that hold the keeper plates in position.

Edges of the bronze keeper plates and edges of the plastic segments are chamfered. Because different size bearings require different size segments, molds are made by the manufacturer and held at his plant.

Cost of converting a lignum vitae liner to bonded resin is about $500; to convert from rubber costs about $1,200. Relining with rubber costs nearly $4,000. About one week is required to convert either type of bearing.

SPARE BEARINGS lined with bonded resin may be stored dry for immediate use. Rubber and lignum vitae must be stored under water or they quickly deteriorate

Additionally, the bonded phenolic resin can be kept dry in storage until required, and a spare bearing can be prepared and stored until needed. Both rubber and lignum vitae must be kept wet at all times or they quickly deteriorate. Experience thus far indicates a probable service life of 10-15 yr for a bonded resin bearing, compared with 15-20 yr for rubber and 5-10 yr for lignum vitae.

The actual life is strongly dependent on the particular application, however.

Tone-Coded Squelch Stops Skip Interference

A two-channel system, utilizing a tone-coded squelch principle, has eliminated two types of radio interference troubles for Central Illinois Public Service Co, with the assistance of Motorola, Inc. One problem was skip interference; the other, local interference.

All of the company's 440 trucks and 33 base stations now use the tone-coded squelch equipment. All signals are locked out of the receiver except those originating within the system.

This eliminates reception of signals from broadcasters in other sections of the country using the same frequency as Central Illinois.

Local interference was caused by strong base stations on the company's own system drowning out mobile-to-base communications. With the assistance of the equipment manufacturer's representative, the company obtained permission from the FCC to operate on a second frequency. Mobile units now transmit on one frequency and base installations on another to eliminate the local interference problem.

(*More How To on page* 76)

THIS MAN'S A SPECIALIST IN PROTECTING YOUR PROFITS. His title is Dowell Service Engineer. His job—to study your maintenance cleaning problems, recommend the proper solutions and apply chemical solvents to help you make more profit. He represents a team of specialists who have rendered old-fashioned all other methods of cleaning product, process and steam generating equipment. His method is Dowell Service, the modern way—using solvents—to remove scale and sludge from all kinds of metal equipment, tanks, piping and lines.

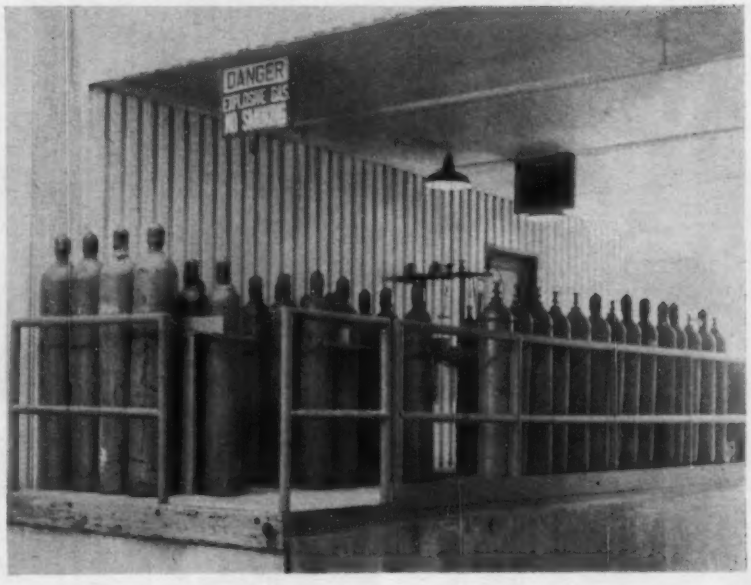
Specifically: one processor had been performing his own turnaround service—using mechanical methods—at an annual cost of $315,000. The Dowell Service Engineer and his team performed the same service in 1/10 of the time at a cost of $2300. The savings in downtime alone amounted to $210,000.

If your maintenance and operating engineers do not know the profit possibilities with Dowell Service, ask them to get the facts for you. For specific information on how chemical cleaning can help your plant to greater profits, call the Dowell office nearest you. DOWELL—A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY. Headquarters and research center, Tulsa, Oklahoma, with 165 offices and stations to serve you.

chemical cleaning services for industry DOWELL

Remote Gas Storage Promotes Safety

E. W. ROBINSON, Chief Engineer, Generation Plants Design, Southwestern Public Service Co, Amarillo, Tex.



Centralized outdoor location of hydrogen and CO_2 supply bottles, with common supply headers serving all generators, has been a standard feature of Southwestern Public Service Co steam plants since 1950. In multiple-unit plants, centralized facilities result in lower investment and safer operating procedures.

While many power companies use outdoor storage of gas bottles to minimize explosion hazards, Southwestern has gone a step further, integrating under one roof all operating functions involved in supplying generators with hydrogen for cooling and CO_2 for purging. These facilities connect to H_2 and CO_2 common header systems running the plant length.

Southwestern designed a standard outdoor storage building utilizing a steel panel wall structure, closed on three sides and top, with front open to permit truck access to bottle racks. The concrete floor is elevated to truck bed height for easy loading and unloading.

Six bottles each of H_2 and CO_2 normally are manifolded, and storage space for 50 H_2 and 20 CO_2 bottles is provided near the manifolds. All bottles stored or in use are secured in individual chain stalls to prevent overturning.

Heavy 1½-in., 40-psig supply lines run underground in 4-in. galvanized guard lines, from the outdoor storage building to the main plant basement. The guard line is sealed at basement wall but left open at the storage building to provide venting in case of hydrogen leaks.

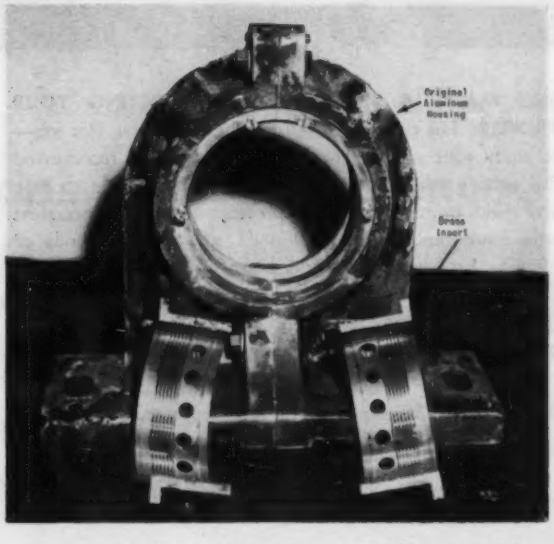
Modified Housings Shorten Fan Outages

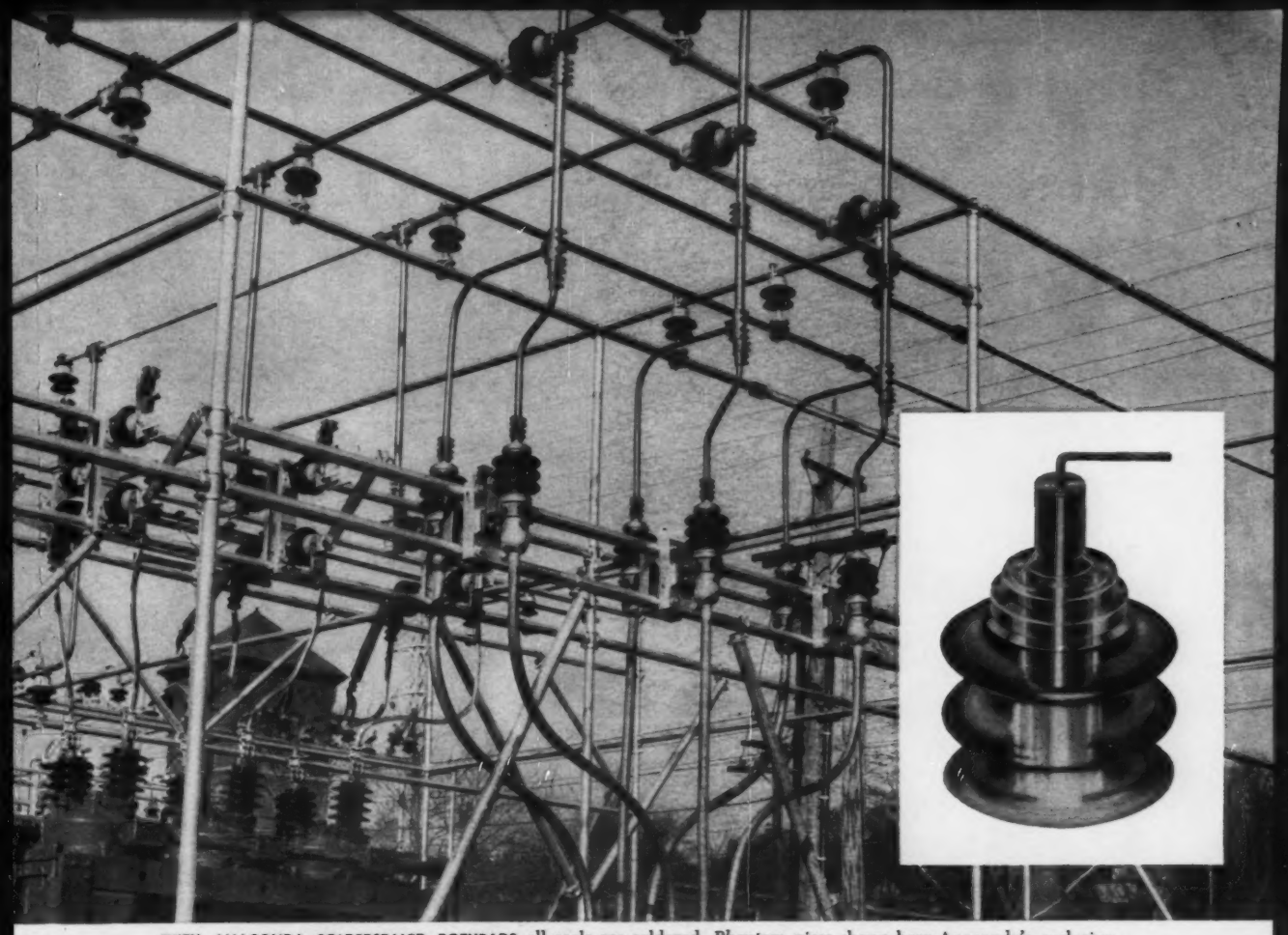
RUSSELL WHITE, Master Maintenance Man, Clifty Creek Station, Indiana-Kentucky Electric Co, Madison, Ind.

Brass seal inserts simplify replacement of worn shaft seals in primary air fans for Indiana-Kentucky Electric Co. Savings of more than $100 per replacement have been obtained.

The seal inserts are made from a brass cylinder and are split to permit assembly over the shaft housing. Flanges are drilled and countersunk for flat-head screws that fasten inserts to the housing. The housing is bored and counterbored and holes are drilled and tapped to accomodate the brass seal insert halves.

Because the original housing and seal were of one-piece construction, 8 man-hr and expensive parts were required to replace a worn seal. Now, only a few screws and worn inserts are replaced.





WITH ANACONDA SOLDERSEALED POTHEADS all seals are soldered. *Phantom view* shows how Anaconda's exclusive "double-action" connection is made through slotted-stem assembly. Connection is achieved by expanding the slotted stem against the inside of the copper hood and by the clamping action of aerial lug on the outside of the hood.

No leaks with dependable Anaconda Solderseated Potheads!

More and More Utilities Adopt Anaconda's Leakproof "Double-Action" Solderseated Potheads

Every seal is sound because all major seals are made *at the factory*—not in the field! And Anaconda's exclusive "double-action" connection means: (1) no misalignment of cable; (2) a permanent electrical connection; (3) faster installation; (4) no damage to hood; and (5) easy relocation.

Proof of the dependability of Anaconda Solderseated Potheads is seen in the fact that more and more utilities are standardizing on these units. Manufactured under the strictest quality control methods, Anaconda Solderseated Potheads give you reliability of design, of product, *and* of service.

You can rely on every Anaconda Accessory. And Anaconda offers a complete line—everything from potheads (Solderseated and gasketed) to splicing materials. Materials for making cable joints are available in convenient jointing kits. They contain everything needed to make a complete single splice. No chance of forgotten materials. Your men have every item required at the right place, at the right time!

For further information on Anaconda Solderseated Potheads and Accessories, see the Man from Anaconda. Write for our Solderseated Pothead Catalog (No. C 79-1330) to: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

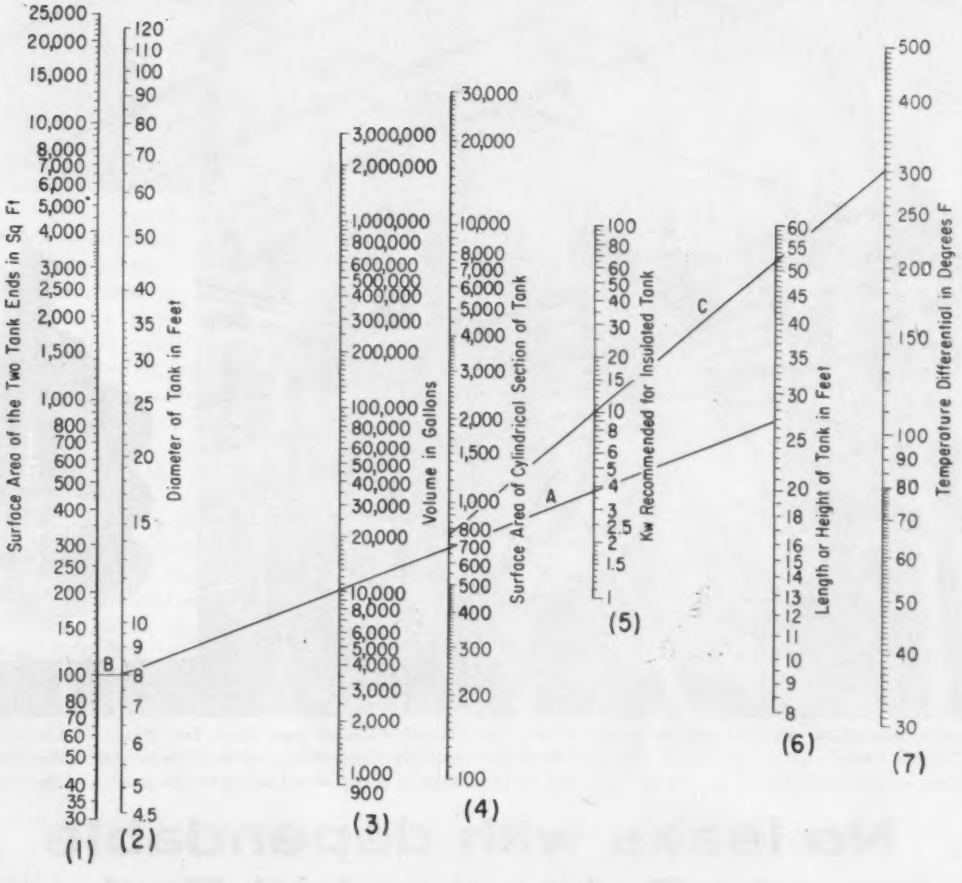
AN ANACONDA JOINTING KIT assures the right materials for the job . . . does away with lost time due to forgotten equipment. Shown above: contents of kit for 3-conductor, 15kv paper-insulated cable. Similar kits are also available for varnished-cambric, thermoplastic- and rubber-insulated cable.

SEE THE MAN FROM

ANACONDA®

FOR CABLE ACCESSORIES

Find Heater Kw to Maintain Tank Temperature



This nomograph was prepared by engineers of Hynes Electric Heating Div, Turbine Equipment Co, Mountainside, N. J. to determine quickly the heater size to maintain a tank of viscous liquids at a specific temperature.

It is used for outdoor tanks with 3 in. of rockwool insulation or equivalent and an average wind velocity 15 mph. Heater rating obtained is sufficient to supply the convection and radiation losses from the surface of the insulation. Additional kilowatt capacity must be installed to raise the temperature of the contents. Because of the many variables involved, the result obtained is not exact, but a close approximation.

Example

Determine the recommended kw rating of a heater to maintain an 8-ft dia x 26 ft 8 in. long insulated storage tank at 325F if the ambient temperature is 25F.

Step 1—Connect 8 ft on scale (2) with 26 ft 8 in. on scale (6) by a straight line A. The intersection of this line with scale (4) gives the area of the cylindrical portion of the tank as 660 sq ft.

Step 2—To determine the total area of both heads of the tank draw a horizontal line B through 8 ft on scale (2) and read area of both heads on scale (1) as 100 sq ft.

Step 3—Adding the results of Step 1 and 2 will give the total surface area of the tank or 760 sq ft. Connect the point representing 760 sq ft on scale (4) and 300F (325F-25F) on scale (7) by a straight (C) and read the kw recommended at the intersection of this line with scale (5) or 10 kw.

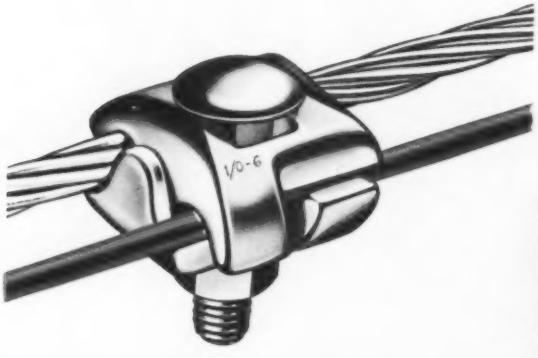
Note: Scale (3) was added since the intersection of line (A) with this scale will give the volume of the tank in gallons.

On the basis that 40 kw in heaters is required to bring the tank contents to a specific temperature, and 10 kw in heaters to maintain it, total load will be 50 kw.

When the contents of the tank reach the required temperature the 40 kw required for heat up may be disconnected, leaving the 10 kw for maintenance of temperature.

* Heater size to bring tank of liquids up to a specified temperature can be determined by nomograph which appeared in Electrical World, Aug. 25, 1958, p 68.

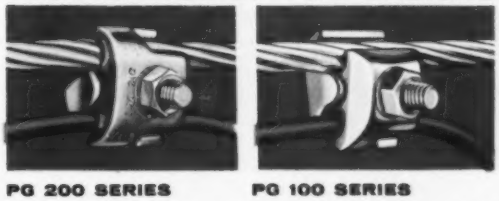
Users know they can install Chance Clamps and Connectors with complete confidence



* Parallel Groove Clamps

Chance Parallel Groove Clamps are designed for low cost, easy to install, efficient power line connections. Heat-treated aluminum alloy body has high resiliency to keep connections tight under all loads and temperature conditions. Available in two types: "AA," uncoated aluminum body . . . and "AGP," with a heavy coating of Chance FORTIFIED Cadmium that resists electrolysis and corrosion in any bimetal connection.

YOUR CHOICE OF TWO DESIGNS



PG 200 SERIES **PG 100 SERIES**

PG 200 Series Clamps have fingers that interlock around the main line and tap line. PG 100 Series Clamps have a wide jaw for the main line—interlocking fingers for the tap line. Both clamps contact ALL outside strands of ALL recommended conductor sizes. Chance Parallel Groove Clamps are also available in 2 and 3 bolt types for heavy service connections.

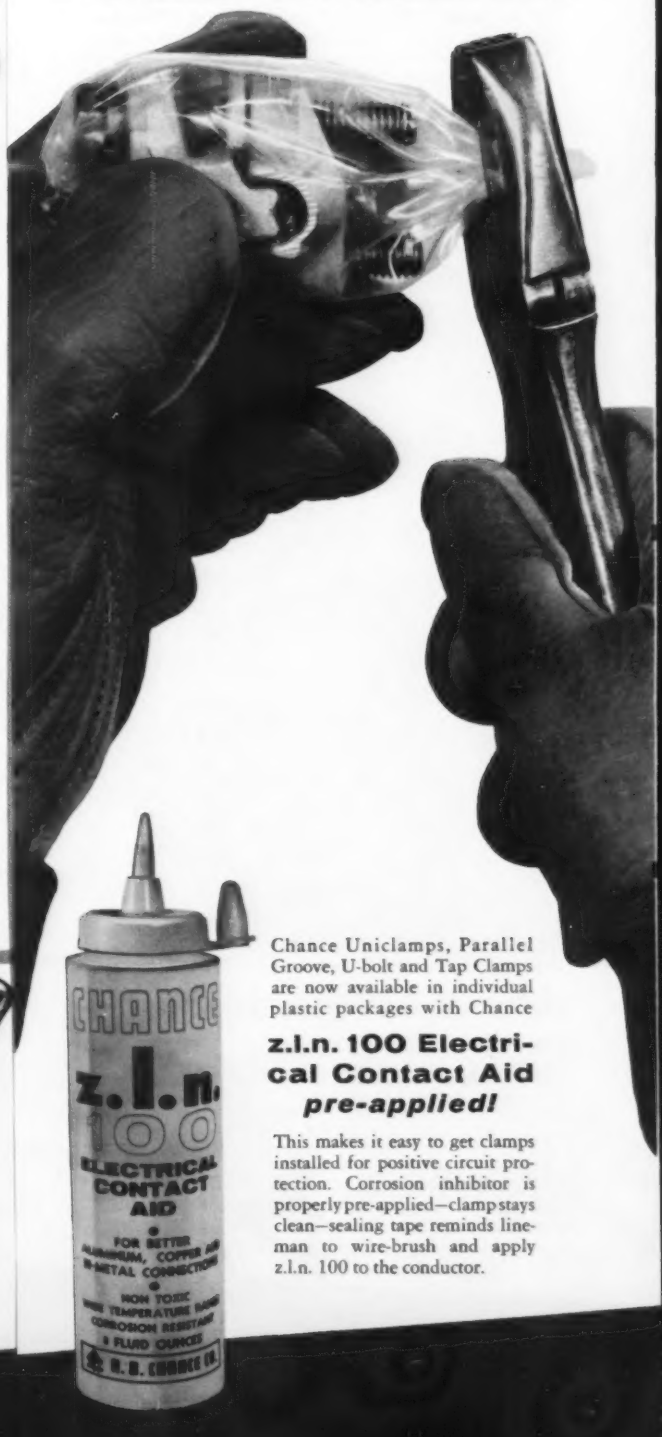
* CHANCE *PC* CLAMPS

Chance "Protected Connection" Hot Line Clamps are counter-balanced, light in weight, and have extra wide jaws for *conductor protection* . . . shielded high-strength spring for *contact protection* against thermal contraction and expansion . . . have threads enclosed in a chamber of lubricant, out of the arc zone, for *thread protection* . . . and are available individually packaged for extra circuit protection.

You can spot it by the RED EYE SCREW

Use AGP with heavy fortified cadmium coating for bimetal connections . . .

PACKAGED FOR CIRCUIT PROTECTION!



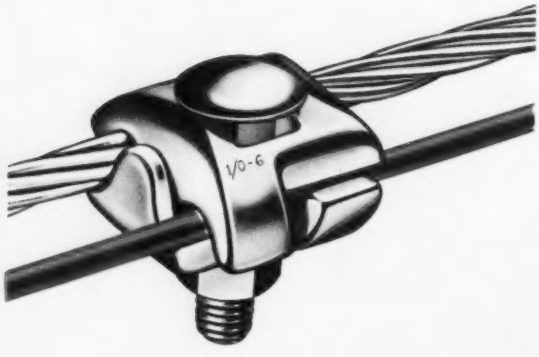
Chance Uniclamps, Parallel Groove, U-bolt and Tap Clamps are now available in individual plastic packages with Chance

z.l.n. 100 Electrical Contact Aid *pre-applied!*

This makes it easy to get clamps installed for positive circuit protection. Corrosion inhibitor is properly pre-applied—clamp stays clean—sealing tape reminds lineman to wire-brush and apply z.l.n. 100 to the conductor.

Users know they can install Chance Clamps and Connectors with complete confidence

because Chance
into every detail t



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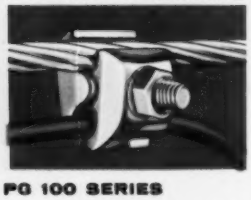
YOUR CHOICE OF TWO DESIGNS

PG 200 SERIES



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Chance Uniclam
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* CHANCE *PC* CLAMPS

Chance "Protected Connection" Hot Line Clamps are counter-balanced, light in weight, and have extra wide jaws for *conductor protection* . . . shielded high-strength spring for *contact protection* against thermal contraction and expansion . . . have threads enclosed in a chamber of lubricant, out of the arc zone, for *thread protection* . . . and are available individually packaged for extra circuit protection.

You can spot it by the RED EYE SCREW

Use AGP with heavy fortified cadmium coating for bimetal connections . . .

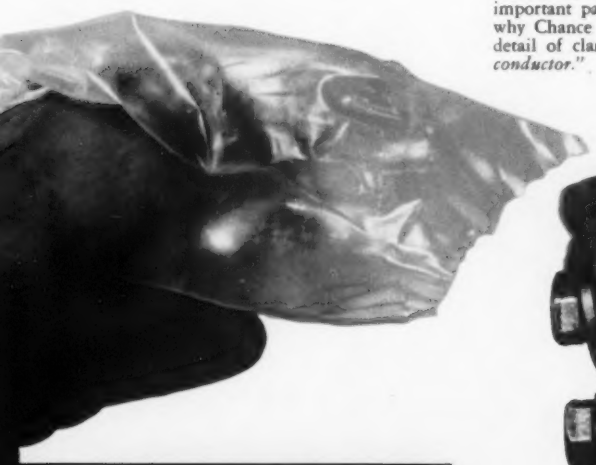
* UNICLAMP

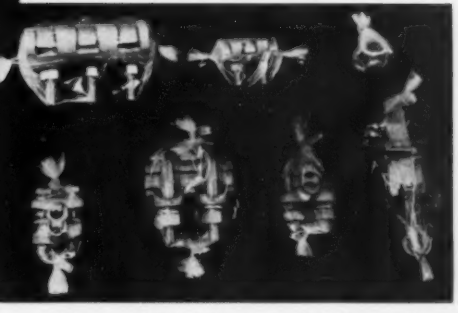
The "one-piece" Uniclamp is popular with engineers who appreciate its high thermal efficiency, and with linemen because it can be installed without taking it apart. Available with aluminum, AGP (General Purpose) or copper bodies. For transmission or heavy duty distribution connections. Uniclamps can be applied with hot line tools.

GENERAL O

ance puts engineering skill
etail to protect your circuit

D. C. HUBBARD, Chief Engineer, Chance Conductor Specialties, says: "In choosing clamps and connectors, remember, that they can protect—or damage—the most important part of your circuit... the conductor. That's why Chance puts so much engineering into every tiny detail of clamp and connector design—to *protect your conductor.*"





nce Uniclamps, U-Bolt Clamps, Parallel Groove Clamps 2 or 3 bolt) and even Chance "Hot Tap" Clamps are lable in individual packages with z.l.n. 100 pre-applied.

LAMPS

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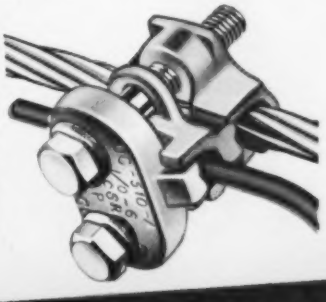


* U-BOLT CONNECTORS

Use these to make tight, low-resistance transmission and important heavy duty distribution connections. Aluminum bodied, in 1 and 2 bolt types for aluminum or ACSR connections. Designed to prevent "bird-caging" under surge conditions.

A • B • CHANCE COMPANY

NERAL OFFICES: CENTRALIA, MO. (A. B. Chance Company of Canada, Ltd., Toronto)

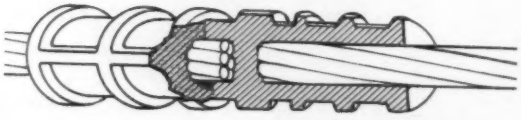
There's always a CHANCE for a better connection

SERVICE ENTRANCE COMPRESSION SLEEVES

Chance Service Entrance Sleeves are made in wide range of sizes to connect #10 Str. AWG through 1/0 ACSR conductors. They can be applied with any standard compression tool.

Color Coded and Plainly Marked

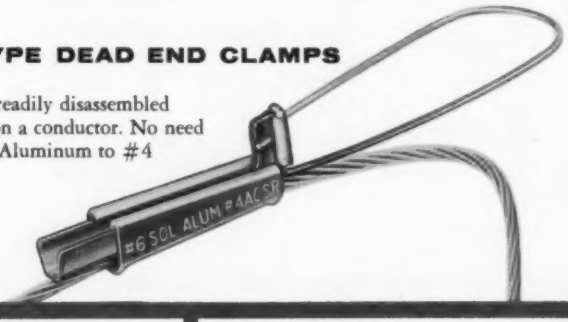
You have quick identification of conductor sizes for each sleeve with easy-to-read, color coded tapes on both ends of the sleeves and the same color coding on the box.



Metal wall in center of sleeve separates conductors—improves bimetal connections. Sleeves are filled with z.l.n. 100 Electrical Contact Aid for best conductivity plus corrosion resistance.

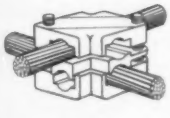
NEW... SERVICE ENTRANCE WEDGE-TYPE DEAD END CLAMPS

Use these clamps for better service drop construction. Can be readily disassembled and assembled, without tools, for easy fastening to any point on a conductor. No need to thread conductor through the clamp. Range from #6 Solid Aluminum to #4 ACSR 6/1 or 7/1.



SPLIT-BOLT CONNECTORS

Give high conductivity plus strength. These Chance copper connectors have the same characteristics as the conductor they connect. You get an efficient cool operating joint that stays tight because both clamp and connector have the same coefficient of expansion. Sizes to fit #10 to 1/0 Str. conductor.



MULTI-TAPS

For cross T, end to end, and parallel connections. Three sizes meet all requirements.

GROUNDING TERMINALS

High strength copper alloy connectors designed for grounding transformer tanks.

GET THIS!

CLAMP AND CONNECTOR CHART It helps you pick quickly—by catalog number—the Chance Clamps or Connectors for any specific job. Write for your FREE chart today.

A · B · CHANCE COMPANY GENERAL OFFICES: CENTRALIA, MO.
(A. B. Chance Company of Canada, Ltd., Toronto)

KG&E Goose Rivals One that Laid Golden Egg

The goose that laid the golden egg had nothing on the goose that spurred sales for Kansas Gas & Electric Co in its four-month quick-recovery electric water heater campaign.

The utility operates in a highly competitive area. Natural gas is plentiful and cheap. The company had never undertaken a water heating promotion but its new rate of 1¢ per 250 kwhrs after 100 made them feel the time was ripe.

First objective was to sell the employees. Most were not too familiar with electric water heating service. The company was divided into 10 groups with a sponsor assigned to each. This included six department heads, two vice presidents, and the assistant to the president. These sponsors were not assigned to groups in their particular fields. For instance, the vice president—employee and customer services had power plants as his group. Each of the 10 groups was then split into employee teams of five members, sales personnel excluded, and a captain named.

In March, meetings were held with all employee groups to discuss the campaign, principles of quick-recovery water heaters, rates, contact techniques, prizes, etc.

Employees were urged to sell customers on the advantages of electric water heating. The customer kept one-half of the prospect card and the employee's receipt was filed. When a customer purchased a new water heater he left his prospect card with the dealer who returned it to the company. Each month the team turning in the most points—one per prospect, 20 per sale—received a $25 team prize.

Each prospect card which resulted in a sale went into a hopper for a drawing. Each employee accounting for the most sales in a month received a transistor radio. The team scoring the most points over the whole campaign, its sponsor, the division manager, and wives, spent a weekend at a local vacation spot.

Here's where the bird figured in. To add a little spirit to the promotion a large goose nicknamed "Georgeous Gertie" was secured. At the end of each month the sponsor whose group was lowest in terms of actual sales per 100 employees had to feed and care for the goose for the following month.

Final results? Take a gander . . .

Total sales were 485 water heaters, (313 more than were sold in the same four-month period last year, and only 15 less than were sold all last year). Top salesman was Stan Bocock, Newton Division, who sold 48 heaters. Also, 63 employees bought water heaters.

Pleased with the campaign results, K. M. LaRue, general sales manager, said, "It served to acquaint our employees and the public on electric quick-recovery water heaters and sell them on the fact that they give top-notch service. It not only sold water heaters but furnished our sales people with a large number of qualified prospects to work on throughout the year."

What happened to Gertie? "She" was discovered to be a "he" and *he* was retired to the company lake to spend his days away from the type of activity which produced the above sales results for Kansas Gas & Electric.

(More Selling on page 84)

State Street to Get $½-Million Lighting Job

Chicago's famous State Street will soon be lighted with a new and revolutionary $½-million fluorescent system that could reportedly make it the brightest lighted (14 ft-candles) street in the world.

The new installation, like the 32-year-old one it will replace, will be owned and operated by the State Street Council, an organization of State Street merchants. It will consist of 70 tree-like steel poles running from Lake to Van Buren Streets. On each pole will be mounted four six-lamp luminaires controlled by radio beep signals located in one of the stores. The lamps are made by General Electric; the poles by Union Metal Co, Canton, O.

With 120 ft-c in drafting room . . .

and 50 ft-c in office . . .

New Lighting Cuts Errors and Improves Work

E. F. COLE, Chemical Engineer, Evans Chemetics, Inc, Waterloo, N. Y.

Replacing inadequate illumination in the general office and drafting department with a well-designed lighting system that produces up to 120 foot-candles has paid big dividends at Evans Chemetics, Inc, a manufacturer of cosmetic chemicals in Waterloo, N.Y. From the management point of view, workmanship has improved and there have been fewer errors. And employee morale has gone up, with the comfortable and adequate lighting. Lighting levels are well above existing industry minimums.

In the drafting room, four 8-ft, 4-lamp fixtures, rated 400 W each, provide 120-ft-c illumination. Similar fixtures are used in the smaller offices and matching 2-lamp fixtures in the remaining areas. Lighting level in the office space is 50 ft-c. Total lighting load with the new system is approximately 7.2 kw.

Fixtures are spaced on 5-ft centers in the drafting room, 7-ft centers in office areas and mounted 8.5 ft above the floor. To insure lighting quality, a direct-indirect type with 45-45 shielding was selected. Ceilings are painted flat white and walls a light yellow to obtain proper reflectances. The previous system, installed in a hit-and-miss manner over a number of years, provided only 18 ft-c.

Electric Hot Plate Solves Temperature Control Problem

B. A. MERRITT, Power Sales Engineer, Union Electric Company, St. Louis, Missouri

The fine temperature control of electric heating plus uniform heating over the entire working area were combined in a 3 kw electric hot plate to make a big hit with the Modern Engineering Co of St Louis. The hot plate replaced a flame-heated plate which had been used to preheat brass nuts so they can be soldered to mating threaded brass couplings. Formerly the nuts were not uniformly heated, which meant that some would not melt enough solder to do a first class job. Others became so hot that they discolored and often scaled off so solder could not adhere. The new electrically heated hot plate assures close temperature limits and uniform high quality soldering operations. It has solved a troublesome temperature control problem for the company.

reflective markings end danger after dark

Where there is danger, colorful markings of bright "Scotchlite" Reflective Sheeting flash a vivid warning to nighttime motorists. These durable, low-cost markings protect your own equipment, too. You show your concern for public safety. And you remind the public of your vital 24-hour-a-day service. Send for informative free booklet today.

REG. U. S. PAT. OFF.

SCOTCHLITE

BRAND

REFLECTIVE SHEETING

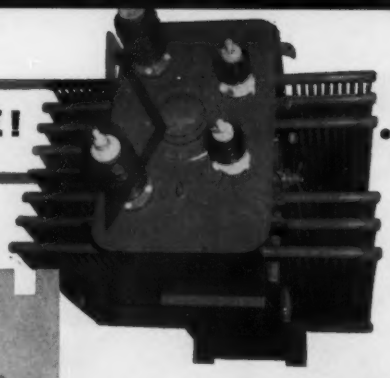
MINNESOTA MINING AND MANUFACTURING COMPANY
where RESEARCH is the key to tomorrow

PRODUCT OF 3M COMPANY RESEARCH

The term "Scotchlite" is a registered 3M Company trademark

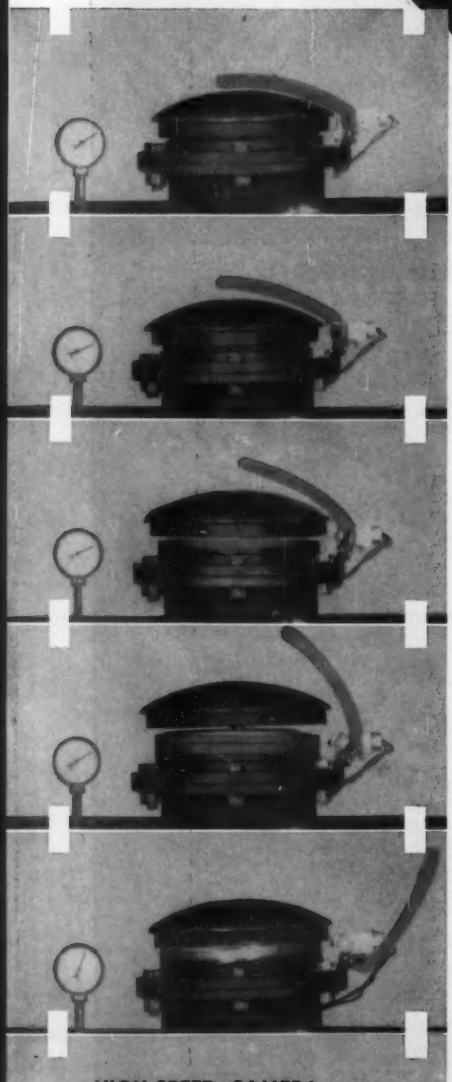
FOR FREE BOOKLET ON REFLECTIVE MARKINGS, WRITE 3M COMPANY, DEPT. QW-988, ST. PAUL 6, MINNESOTA

IT'S HERE! ...*NOW Standard*



NEW *Positive-acting* PRESSURE-RELIEF DEVICE

- **FULLY AUTOMATIC**
- **SELF-RECLOSING**
- **SELF-RESETTING**



HIGH-SPEED CAMERA SHOWS OPERATING CHARACTERISTICS OF RELIEF DEVICE

These excerpts from a high-speed camera film illustrate both the speed and accuracy with which Pennsylvania's new pressure-relief device operates. In the top frame, 1, the pressure is approaching the predetermined setting (in this case, eleven pounds). In the second frame, the pressure limit has been reached, and the resulting operation is shown in frames 3 and 4. In the bottom frame, 5, the cover is starting to return to the closed position. *The total elapsed time for this sequence was 0.68 seconds.*

The new mechanical pressure-relief device developed by Pennsylvania Transformer engineers is completely automatic. It relieves internal pressure at a predetermined setting by temporarily breaking a gasket seal to permit gas or oil to escape around the cover . . . then *automatically* reseals itself so that the device is again fully effective.

NO PARTS TO REPLACE . . . NO RESETTING NEEDED

By eliminating the glass disc or diaphragm used on ordinary pressure-relief devices, this new Pennsylvania development does away with the time-consuming task of replacing parts. In addition, the need for periodic inspection has been eliminated. There is nothing to break . . . nothing to fall into the transformer . . . nothing to get out of alignment. Highly corrosion-resistant materials are used throughout: anodized aluminum for the cover and flange, and stainless steel for the shaft.

NO BREATHING TAKES PLACE AFTER RELEASE OF PRESSURE

An additional advantage over ordinary pressure-relief mechanisms is that the cover reseals itself while a low positive pressure still exists within the transformer. This definitely prevents breathing. Moisture *cannot* enter the transformer before, during or after the valve has functioned.

Dramatic proof of resealing effectiveness has been obtained from operating tests conducted with the relief device fully submerged in liquid. The inside of the valve remained *free of moisture.*

FULLY TESTED FOR DURABILITY, EFFECTS OF HEAT AND COLD

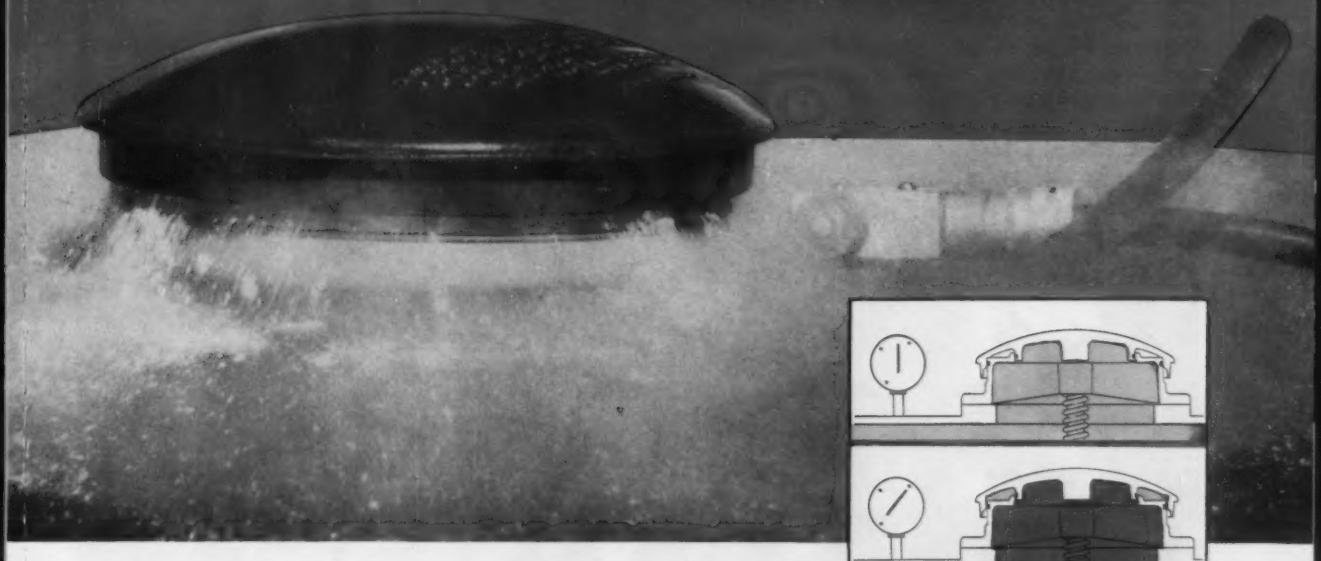
In addition to immersion tests, Pennsylvania's new pressure-relief device has undergone tests for conditions that far exceed any that are likely to be encountered in actual service. These include life tests of as many as *12,000 operations* with standard production

PENNSYLVANIA TRANSFORMER

PENNSYLVANIA

on all Pennsylvania Power Transformers

The pressure-relief device is shown in the closed position (right) and while operating (below). The upward movement of the cover causes the optional signal arm to pivot to an upright position.



models of the valve.

During life tests, the pressure-relief devices were intermittently operated at temperatures as high as 100°C., and also at −15°C. with a heavy formation of ice on the cover. To test the effect of hot oil, valves were immersed in 100°C. oil, with gaskets fully exposed, for as long as 96 hours.

VALVE OPERATES WITHIN ±½ POUND OF PREDETERMINED SETTING

At no time during the foregoing tests did the valves fail to operate within ±10% of the original setting. Following the tests, *all* relief devices were found to be pressure tight.

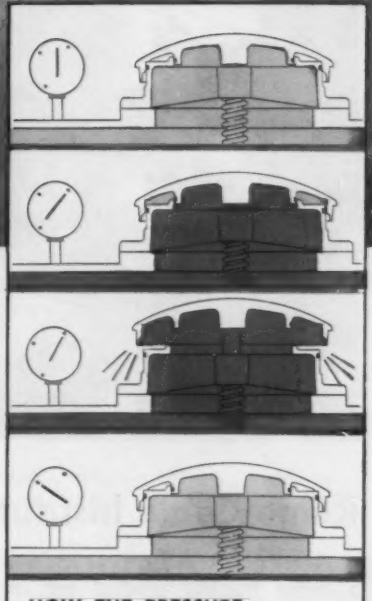
Pressure-relief devices supplied on Pennsylvania Power Transformers operate within the even closer tolerance of ±½ pound of the predetermined setting. This is assured by standard pretesting of production models. To further safeguard the transformer, the device relieves internal pressure within a split second after the predetermined setting is reached—as shown in the accompanying high-speed camera shots.

OPTIONAL ALARM AND SIGNAL ARM CAN BE RESET FROM GROUND LEVEL

Pennsylvania Transformer's new pressure-relief device is supplied with a combination alarm and signal arm, if requested. The signal arm, which is painted red, is easily seen from ground level when in an upright position. Resetting the signal arm—which can be done from ground level with a hot stick—also resets the alarm.

The new maintenance-free pretested pressure-relief device is available on all Pennsylvania Power Transformers with or without the combination alarm and signal arm. Contact Power Sales Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW-EDISON



HOW THE PRESSURE-RELIEF DEVICE OPERATES

When the predetermined pressure at which the device is set to operate is exceeded, the spring force acting on the cover is overcome and the pressure, initially confined to the small "primary" area of the relief cover, escapes to the larger "secondary" area. This immediately multiplies the force acting on the cover and lifts it to its full open position, thus allowing the pressure to escape to the atmosphere. The spring force then resets and reseals the device while an internal pressure of approximately five pounds still exists within the transformer.

POWER TRANSFORMERS

GE Plans $47 Million Transformer Plant Modernization

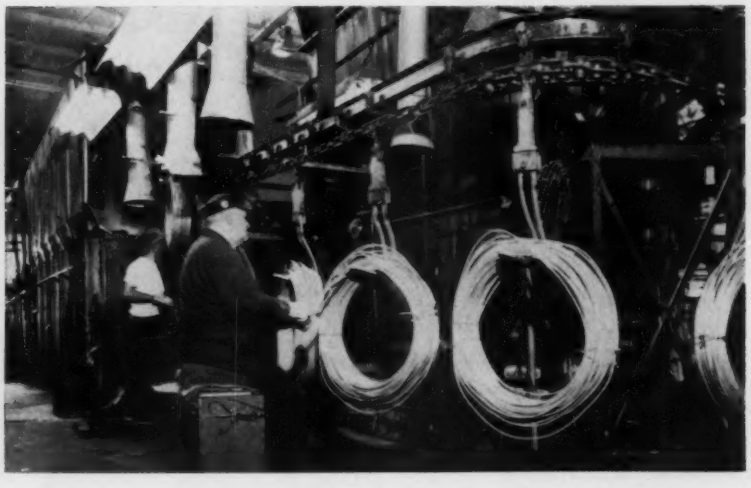
Major Portion Allocated for Power Transformer Facilities

General Electric Co plans to spend $47 million in the next five years to modernize its transformer plant facilities at Pittsfield, Mass., Raymond W. Smith, general manager of the company's transformer division announced the last week in August.

He predicted a boom in general business conditions by 1960 and 1961 that would bring a labor shortage to the Pittsfield area, where employment at General Electric's transformer plants is presently down to 8,700 from 11,000 employees on Jan. 1, 1957.

Although he disclosed no details of the $47 million plan to renovate the company's transformer facilities, Smith said the outlay was fully justified by business prospects. "Particularly heartening is the backlog in the electric power industry of $350 million in potential orders not yet placed by utilities" Smith reported.

Improvement in power transformer business should begin to be felt next year, he said, following upturns that are already becoming apparent in housing, major appliances, autos, and steel. A major portion of the modernization funds, he indicated, would go to improve power transformer manufacturing facilities, while smaller investments will be made in the distribution transformer and ordnance plants.



Rome Cable Institutes "Hot" Pickling

Faster pickling of copper rod and a better finished product are resulting from new continuous "hot" pickling process facilities now in operation at the Rome, N. Y. rod mill of Rome Cable Corp, according to Charles Ellis, vice president in charge of manufacturing.

In this process coiled rods are carried into the pickling tank on hooks on a chain conveyor as shown above. Because the coils are suspended rather than merely being submersed in the solution, all surfaces are pickled evenly. Also, movement of the coils through the tank agitates the pickling solution for maximum exposure.

The pickling solution is circulated through heat exchangers to maintain the proper temperature in the bath. A copper reclamation system reclaims copper dissolved.

Average pickling capacity of the bath is 50,000 lb of copper per hour. However, as many as 250 coils, each weighing 250 lb, can be processed per hour. About seven minutes is required for each coil to move through the 95-ft-long bath.

Special tanks were designed featuring an outer steel shell and an inside layer of vulcanized rubber covered with acid-resistant brick. This protects the rubber from abrasion by the coils and excessive heat.

Reynolds Opens Plant

An $11.5 million office building containing 1,235,000 lb of aluminum will be dedicated this month by the Reynolds Metals Co. The Richmond, Va. building will feature reportedly the world's largest system of automatic sun louvers, movable office partitions, and acoustical and light-diffusing ceilings. Complete details will follow in a subsequent issue.

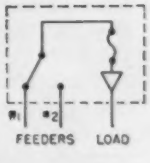
Ormet's Al Reduction Plant Starts Production

Primary aluminum is being produced from Ormet Corp's aluminum reduction plant, according to Walter F. O'Connell, president of Ormet. Full scale operation at the $110 million facility is scheduled for the end of the year. It has an annual capacity of 180,000 tons, reportedly will be the nation's fourth largest aluminum producer and is located between Clarington and Hannibal, O.

Ormet is owned jointly by Olin Mathieson Chemical Corp and Revere Copper & Brass Inc.

First major unit of the facility to start production was the carbon plant. This was necessary to build an inventory of rodded carbon anodes before energizing the pot lines. At full production, the aluminum reduction plant will have an

(*Continued on page* 90)



UNICLAD with feeder selector oil switch, 3 pole, 15 kv, 400 ampere full load break and three disconnect type power fuses.

G & W SWITCHGEAR—TO SUIT *YOUR* REQUIREMENTS

Profit by G&W's experience in designing and manufacturing countless combinations of switchgear to suit customers' specifications and budgets. A solution to your problem may exist in our files. Or a slight modification of a similar installation may save you hundreds of dollars in engineering time.

Typical of the G&W line of switchgear—rated from 5.0 to 34.5 kv, 75 to 200 kv BIL—is the Uniclad illustrated. It is a G&W "custom" job made to suit the plant layout and operational convenience of a large west coast laboratory. Four such units serve as primary service entrance switches to the plant. In each, standard components were used. A three position selector is used to transfer the feeder circuits manually (provision is made for adding an automatic control) in the G&W load break oil switch. Installation at the site is simplified by assembling all components at our factory in the trim looking Uniclad (metal enclosure).

Get switchgear to suit *your* requirements the quickest and easiest way—call a G&W representative.

G&W ELECTRIC SPECIALTY COMPANY
3500 W. 127TH STREET • BLUE ISLAND • ILLINOIS
CANADIAN MFR.-POWERLITE DEVICES, LTD.• TORONTO, MONTREAL & VANCOUVER
U582

(Continued from page 88)

annual consumption of about 90,000 tons of carbon.

One reduction pot line has been put in operation. Four more lines are scheduled to be brought in at 60-day intervals. Adjacent to the Ormet reduction plant is an aluminum rolling mill for production of flat and coiled rolled aluminum products.

Power for the facility was originally supplied from the American Electric Power System. The supply will be gradually shifted to the Kammer plant of Ohio Power Co at Cresap, W. Va. Here the first of three 225,000-kw generating units is in operation. The Kammer plant will generate its power from coal mined at the adjacent Ireland Mine of Consolidation Coal Co.

Wilbur Armacost Given ASME Medal

The American Society of Mechanical Engineers Medal has been awarded to Wilbur Hering Armacost vice president-consultant and chairman of the technical committee, Combustion Engineering Inc, New York. The medal is given for distingushed service in engineering and science.

The accompanying citation read, "For his thorough knowledge of engineering, for his application of scientific principles and results of experimental research to design problems, for his outstanding leadership in the advancement of design and materials in the field of steam power generation, for his administration of engineering design, operation and research."

Armacost, who has been awarded over 75 patents, is credited with fostering such developments as the controlled circulation boiler and the supercritical boiler.

Pocket Receiver and Transmitter Introduced

A "Handie-Talkie" pocket receiver and separate pocket transmitter have been introduced by Motorola Inc, Chicago, Ill. The pocket receiver picks up all radio signals on a system's frequency, and communication can be maintained with the system's base station or any of its mobile stations.

The pocket receiver utilizes 17 transistors and five diodes for high sensitivity levels. Semiconductors contribute to the low power drain characteristics and high reliability standards of the receiver, according to the manufacturer. Modular high quality printed circuits make up the shock-mounted inner chassis.

The transmitter provides a 1.25-w radio frequency output in the 25-54 Mc band and 1.0 w in the 144-174 Mc band. The receiver operates in the same frequency bands.

Weller Has Soldering Iron

A soldering iron using magnetic force for automatic control of temperature is being manufactured by Weller Electric Corp, Easton, Pa. The Magnastat is made of a special alloy with a magnetic quality which is lost and regained at certain predetermined temperatures. The iron is made of a series of stainless steel tubes which protect the sensing mechanism in the tip and reportedly make the iron stronger and longer lasting. Allegheny Ludlum Steel Corp. supplies the stainless steel and parts of the interior workings.

Two Large Transformers to be Built in Canada

Two 340,000-kva, 15.2/230-kv, power transformers, reportedly the largest built in Canada, have been ordered from Canadian Westinghouse Co Ltd, Hamilton, Ontario, by the Ontario Hydro Commission. The units, to be delivered in 1960 and 1961, will be installed at Hydro's 1,800,000 kw generating station at Lakeview, near Toronto.

Each transformer will weigh close to 300 tons, will be over 30 ft high, and contain 15,000 gal of insulating oil. Westinghouse has developed a special cooling system for the transformers that will make it possible to ship the assemblies with minimum dismantling after final high voltage testing.

Duke Gets IBM Equipment

Duke Power Co., Charlotte, N. C., has placed an order with International Business Machines Corp, New York to lease an IBM 705.2 data processing system for commercial application. The power company will use this equipment for such operations as customer billing and payroll preparation. It will also be available for engineering studies.

MANUFACTURERS BRIEFS

Hi-Frequency Systems, Inc, Vermillion, Ohio, has been formed as an engineering service company to provide clients with application engineering service, research and development service, and with specialized electrical components for complete high frequency systems in the lighting and equipment fields.

Gulton Industries, Metuchen, N. J., has developed an ultrasonic aluminum foil welder, a hand-operated unit which welds aluminum foil in continuous seams. The welder is powered by a 100-w ultrasonic generator, operates at 20,000 cycles, and has been tested on aluminum foil down to 0.0003 in. A potential of the foil welder is the use of aluminum for electrical connections.

Pittsburgh Standard Conduit Co, Pittsburgh, Pa., has supplied almost 19 miles of galvanized conduit to safeguard the electrical circuits on the five-mile long Mackinac Bridge in Michigan. The 140 miles of wiring on the structure are used for traffic control, power cables, marine navigational lights, telephone wires, airplane beacon lights and many other electrical devices on the bridge.

Republic Electric & Development Co, Seattle, Wash., has established a sales and manufacturing branch in Peoria, Ill. The company manufactures electrical drives and controls for the forest-products industry, and switchgear panels and controls in industrial fields.

Here operator checks application of special lacquer coating which gives CIRTUBE EMT its easy fishing.

The fishing's easier, too with new CIRTUBE* EMT

PULLING wire through carelessly made, ordinary EMT often proves an annoying, time consuming business.

The answer isn't just a slick inside surface—what's needed also is a sort of built-in lubrication that helps conductors glide smoothly through long runs.

CIRTUBE EMT is made that way—with a baked-on protective inner coating containing wax-like ingredients in a special formula—always carefully applied to give the same easy fishing each time.

Here are other reasons why CIRTUBE EMT is always so easy to fish: clean, snag-free finishing is one; induction welding is another. This superior welding technique leaves no flash or bead to interfere with wire pulling.

Easy fishing is only one of many reasons why CIRTUBE EMT has won such quick acceptance. Give it a try next time you order—you'll like working with it. Now at your Circle wholesaler's. *Trade Mark

CIRCLE WIRE & CABLE
a subsidiary of CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

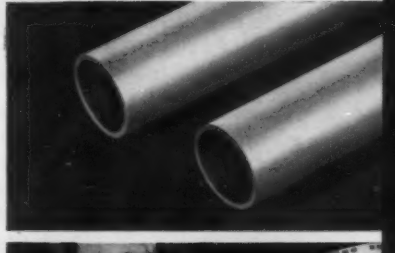
CIRTUBE EMT *Ask for it!*

Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.

Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.



Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

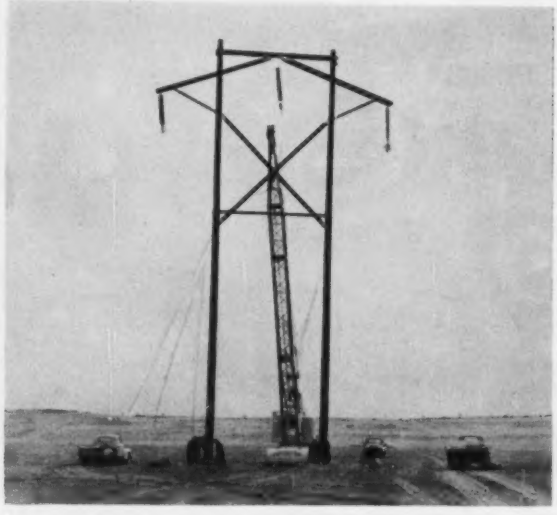
Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

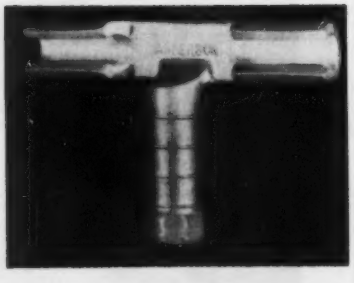
New Equipment

H-Frame Spreader Bar . . .

. . . can set wide variety of structures, complete with insulators and stringing sheaves. Structures with any pole size, spacing, or type of crossarms, with or without X braces, can be handled. Spreader bar lowers itself from erected structure automatically, so man does not have to go up pole until conductors are ready to be clipped in. Three different lifting eyes permit setting of structures where pole on one side is heavier or longer than pole on the other side.

Petersen Engineering Co, Inc, Santa Clara, Calif.





Compression Connectors

. . . can be used with copper or aluminum transformer primary and secondary connections or with secondary drops. This DCT line is offered in 40 sizes to handle cable combinations from No. 4 stranded through 400 Mcm. Only three die sizes are needed for entire series; run and tap use same die and are marked for indenting. Connectors are marked with cable and die sizes. Tap barrel is filled with inhibitor and capped. Sealed packaging is available if inhibitor in run groove is desired.

Anderson Electric Corp, Birmingham 1, Ala

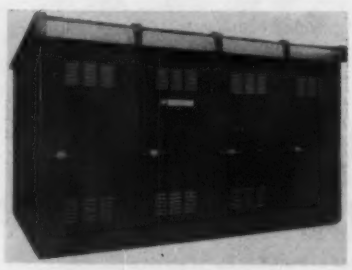
Switch Conversion Kit . . .

. . . increases current rating of high voltage tilting insulation air switches without removing switch from mounting. Kit converts 200-amp 2ST and 3ST switches to 400 or 600 amp and increases 400-amp units to 600 amp by simply mounting additional 200- or 400-amp jaw contacts on pre-drilled jaw terminal plate, to supplement existing multiple 200-amp contacts. ST switches are available in ratings from 7.5 to 34.5 kv.

I-T-E Circuit Breaker Co, R&IE Equipment Div, Greensburg, Pa.

Outdoor Housings . . .

. . . for metal-clad switchgear have both labyrinth seals and neoprene gaskets on front and rear doors to provide double weatherproofing. Louvers in both doors are backed by washable filters to prevent entry of dust or water. Offered in both



standard outdoor-type and walk-in shelter-type, they may also be used for low-voltage metal-enclosed switchgear, high voltage contactor-type motor starter assemblies, and metal-clad disconnects and interrupters. Front and rear of housing have 250-w heaters. End units are designed for easy addition of future units. Steel construction is standard; aluminum is optional.

Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.

Angle Bending Guage . . .

. . . saves time in bending pipe and conduit. Notched protractor design allows exact degree of bend to be locked in. Degree of bend needed may be simply determined by setting the protractor to the proper angle and locking it in position. Guage can be used for checking during bending or after bend is completed. Made of zinc plated steel, with black figures, the guage has overall length of 70.5 in.

Greenlee Tool Co, Rockford, Ill.

Interrupter Switches . . .

. . . with high speed operation can close unfused switch against 3-phase faults up to 250,000 kva at 13.8 kv with negligible damage. With current limiting fuse, limit is as high as one million kva. Tog-L-Snap

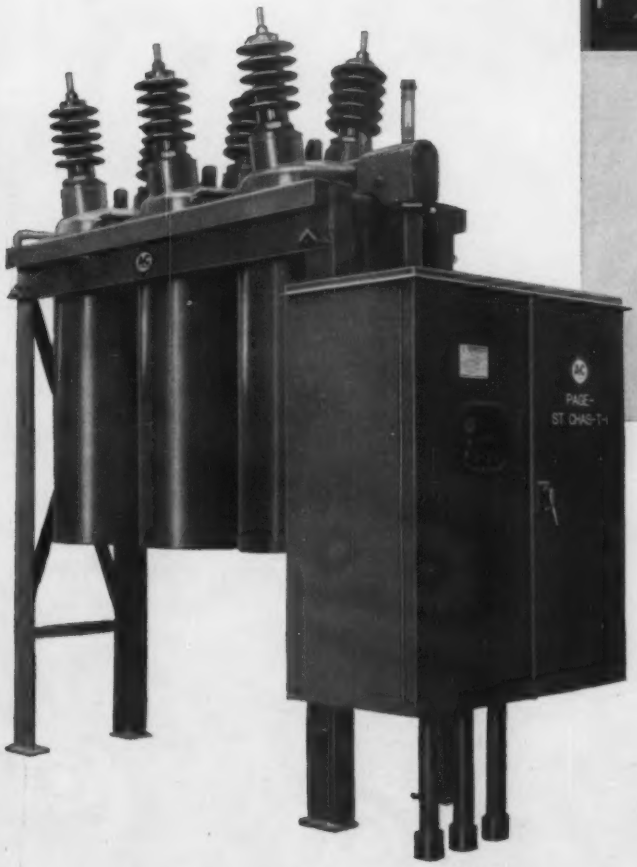
(*Continued on page* 96)

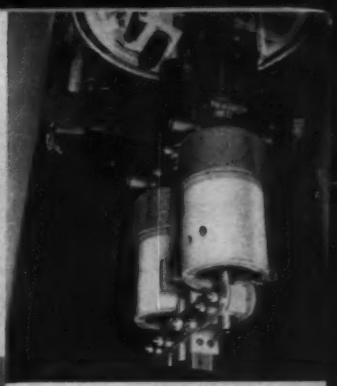
for
reliability

for ease
of maintenance

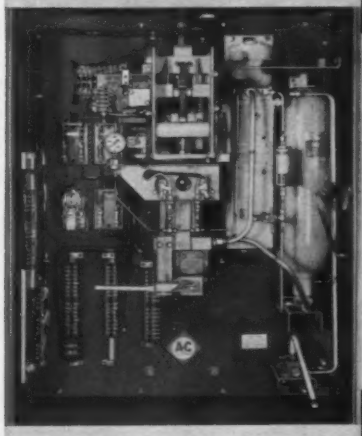
for ease
of operation

...3 top breaker features

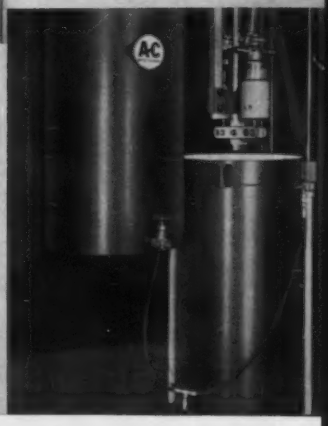




❶ Fast contact opening and closing proved by time and laboratory tests. *Turbo Ruptor* device features bayonet and segmented tulip for wiping action, positive contact and absorption of mechanical impact.



❷ Simple design, with few moving parts . . . the *Pneu-Draulic* operator offers many advantages. Dust, dirt, moisture, heat and cold are no problems. Field-proved in dozens of utilities.



❸ Full access to tanks and contacts unobstructed by framework. In addition, optional power-operated hydraulic tank lifter eliminates hand cranking, makes it safe and easy to lower and raise tanks.

Allis-Chalmers large frame-type breakers have many quality features

Careful attention was given to every detail of design and construction. The result: today's top breaker value!

In addition to the features pictured above, you'll find self-cleaning, smooth, fabricated steel tops for each tank; ball-type position indicator visible from greater distances; float-type oil gauge that eliminates leakage; full tank skirt for added stability when tank is on ground.

For details, contact your nearby A-C office or write for Bulletin 71B8475. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

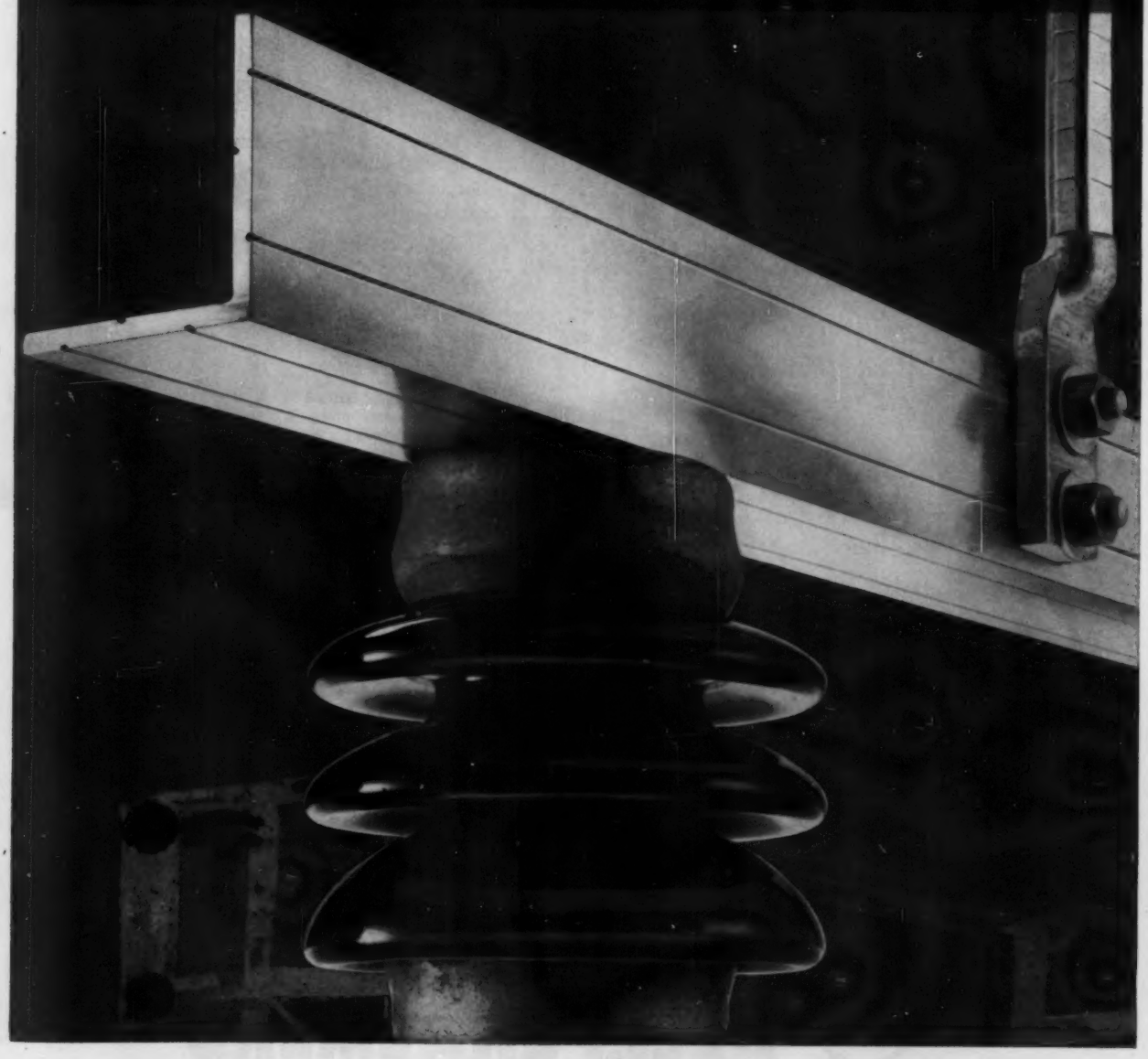
A-C ALLIS-CHALMERS

A-5672

ALLIS-CHALMERS

Pneu-Draulic and *Turbo Ruptor* are Allis-Chalmers trademarks.

ALCOA UABC UNIVERSAL ANGLE BUS CONDUCTOR SPEEDS CONNECTIONS WITH



NEW LOW-COST DESIGN FOR SMALLER SIZES OF SUBSTATION BUS CONDUCTOR ADAPTS TO NORMAL CABLE LUG CONNECTORS

Here is the latest development by Alcoa to help you save money. Universal Angle Bus Conductor —UABC.

This aluminum extruded L-shape provides a new low-cost type of bus conductor. Designed primarily for use in distribution-type substations, it can also be used advantageously in substations for subtransmission voltages and primary distribution voltages.

Alcoa® Aluminum UABC offers new convenience features that speed installation. Extruded grooves on the inside and outside of each leg locate the center points for drilling holes.

With Alcoa UABC, fewer and less expensive fittings are needed. Normally, the large number of fittings required cost more than the bus. In contrast, Alcoa UABC can be installed simply with bolts. Simple terminal connectors are used to make taps or flexible connections.

Years of Alcoa research and development, plus months of field testing, stand behind this new conductor. A good balance of mechanical, physical and electrical characteristics of this new conductor is incorporated by its shape and Alcoa No. 2 EC bus alloy.

Alcoa Universal Angle Bus Conductor is available *now* in the 3¼ x 3¼ x ¼-in. size in standard 25-ft lengths and is rated at 1,300 amperes. In most cases, the new conductor involves only one UABC per phase. For more information, call Alcoa today. Or write, Aluminum Company of America, 2306-J Alcoa Building, Pittsburgh 19, Pennsylvania.

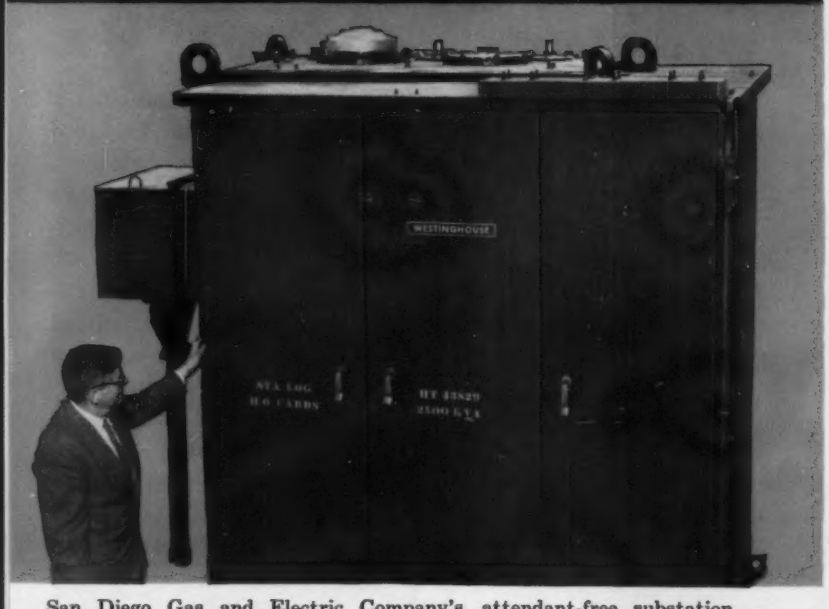
Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ELECTRICAL CONDUCTORS AND ACCESSORIES
ALUMINUM COMPANY OF AMERICA

ALCOA THEATRE
Fine Entertainment
Alternate Monday Evenings

Ask your Westinghouse representative
about the exclusive benefits you get from

CONTACT-FREE
MAGAMP CONTROL WITH
MAINTENANCE-MISER DESIGN...
BASIC FEATURE FOR
ATTENDANT-FREE SUBSTATIONS



San Diego Gas and Electric Company's attendant-free substation serving San Diego Junior College at Balboa Park is equipped with trouble-free Westinghouse Magamp control.

Attendant-free substations demand maintenance-free components. When Westinghouse load tap changers are used on a CSP® power transformer, load tap changing substations transformer or station-type voltage regulator, there too is found the contact-free Magamp* control.
Magamp control, with Maintenance-Miser design for both the primary relay and time-delay relay, assures you of the economic advantages of trouble-free service from your attendant-free substations. Here's why:

- No moving parts to clean and adjust.
- No contact to check and burnish.
- Relays never need to be rebalanced.
- "Set-and-forget" control never needs adjustment.

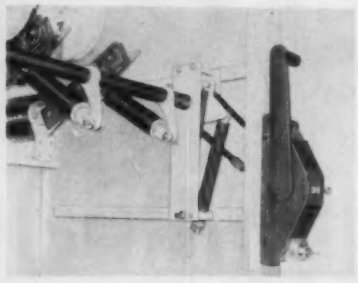
Call your Westinghouse representative for the complete story of how you can improve your power distribution economics with attendant-free substations equipped with Magamp control . . . another example of how PLOWBACK OF EARNINGS into research and development is helping you meet the increasing problems created by America's electrical growth.

*Trade-Mark J-70874

YOU CAN BE SURE...IF IT'S Westinghouse

Interrupter Switches

(*Continued from page* 92)



toggle spring device has speed which is independent of manual actuation on both opening and closing. Small and easily installed, these switches are well-adapted to loop circuit switching. Ratings include 600, 1,200, and 2,000 amp at 4.8, 7.2, 13.8, and 14.4 kv.
R&IE Equipment Div, I-T-E Circuit Breaker Co, Greensburg, Pa.

Adjustable Speed Drives . . .

. . . of M-G type combine d-c versatility with a-c convenience and economy. They are available in ratings from 3 to 200 hp for single or multi-motor applications. Standard speed ranges up to 8-to-1 are provided by armature voltage control; additional ranges by armature voltage and motor field control are also offered. Static components eliminate warm-up time and reduce maintenance. Bulletin SM-280.
Square D Co, 4041 N. Richards St, Milwaukee 12, Wis.

Electric Stud Heater . . .

. . . provides fast, even heat for shrink-tightening of large studs and holding bolts in steam pressure vessels, motors, or turbines, where maximum tightness is desirable. Inserted in holes drilled in the studs, they expand the stud enough to tighten the stud in a few minutes. When the studs cool off, the contraction draws them down tight. These Chromalox units heat the studs to a controlled uniform temperature, allowing accurate predetermination of the amount of heat needed for stud elongation.
Edwin L. Wiegand Co, 7500 Thomas Blvd, Pittsburgh 8, Pa.

Close-Coupled Pump Motor

. . . in ratings from 7.5 to 100 hp is available in standard and special models. These Tri-Clad 55 motors have solid cast rotor with no bolted or welded parts, cast iron frames, and permanently numbered leads. Weight reductions are up to 33%. Labyrinth seal on both sides of housing keeps grease in and dirt out. Standardized shaft extension and C-face end shield reduce number of parts required for wide range of ratings.
General Electric Co, Schenectady 5, N. Y.

Wiring Trough . . .

. . . with 2½ x 2½ inside dimension is available in one, two, three, four, and five-ft lengths, along with end caps, 90-deg internal elbow, Tee connectors, U connectors, and other fittings. Covers have keyholes slots so they may be removed without removing screws. Four ½ and ¾-in. concentric knockouts are spaced on 3-in. centers along opposite sides of trough. Fittings and trough are finished in baked blue-gray enamel.
Wadsworth Electric Mfg Co, Inc, Covington, Ky.

Vertical M-G Charger . . .

. . . for industrial truck batteries cuts floor space requirements by two-thirds. Four sizes provide choice of 25 ratings, covering range up to 800 amp-hr. After unit has been connected and front-panel pointer set, current automatically starts at proper rate and is controlled constantly throughout the charge. Simplified, standardized design simplifies maintenance. These EP chargers have 2-, 3-, and 7.5-hp ratings and operate on 2- or 3-phase supplies at 220, 440, or 550 v. They can be wall-mounted.
Exide Industrial Div, Electric Storage Battery Co, Box 8109, Philadelphia 1, Pa.

More New Products

Type JR **key-operated switch** provides tamper-proof protection of complex electrical circuits. Control of up to three sections, eight positions is provided. Switch can be locked in any position by key removal. Rating is 10 amp, 125 v ac, 5 amp 125 v dc.—Electro Switch Corp, 167 King Ave, Weymouth 88, Mass.

Line-A-Spede **motorized gear unit** for installations where down time is critical has double, triple and quadruple reduction units with ratios up to 1487 to 1 for one to 75-hp motors. Bulletin 2350.—The Louis Allis Co, Dept P, 427 E. Stewart St, Milwaukee 1, Wis.

Transistor **pipe locator and metal detector** has maximum range of 21 ft and operates on flashlight batteries. Receiver batteries last 3,000 hrs; transmitter batteries, 350 hrs. —Gardiner Electronics Co, 2545 E. Indian School Road, Phoenix, Ariz.

Silicon rectifier supply for industrial d-c applications comes in a-c input ratings up to 600 v, 3 phase, 60 cycles. D-c outputs are 5 to 400 kw for 2-wire, 250-v systems and 5 to 300 kw for 3-wire, 125/250-v systems. Regulation is less than 5%; ripple is 5% rms maximum. —American Rectifier Corp, 95 Lafayette St, New York 13, N. Y.

Type K drip-proof hydraulic **elevator motors** are available in ratings from 2- to 10-hp at 1800 rmp for 208-220/440 or 550 v, 3 phase, 60 cycle. They are short-time rated 50C rise over a 45C ambient with a service factor of 1.0. Minimum starting torque is 150%, minimum breakdown, 200%.
A 200-w, 4,000-lumen incandescent open **lighting fixture** for farms, outbuildings, storage areas, and driveways has an integral photo-electric control. Adapter with three predrilled slots allows 45-deg turning to meet special lighting requirements.
Carbon **brush holder** for a-c and d-c motor and generator brushes consists of one-piece die casting and coiled spring which eliminates periodic adjustment of brushes and reduces sparking.—General Electric Co, Schenectady 5, N. Y.

MAGAMP CONTROL . . . PREFERRED BECAUSE:

Mr. C. D. Mack, Electrical Maintenance Supervisor, San Diego Gas and Electric Company, sets control of attendant-free substation serving San Diego Junior College.

Here are the "plus" features that have made Magamp* control the preferred control:

- Completely static — no moving parts in either sensing or timing devices.
- Complete stability after setting.
- All control setting is electrical.
- ASA Class I accuracy.

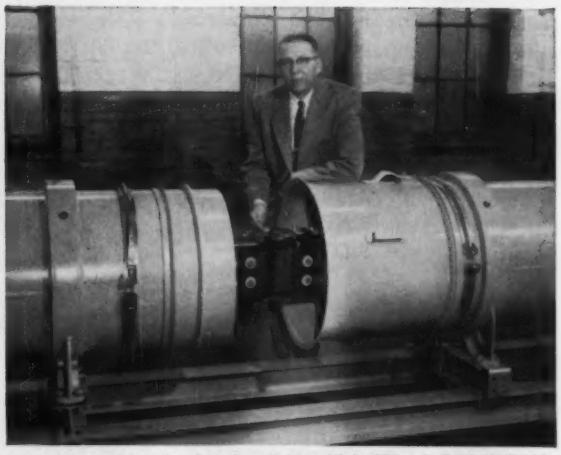
. . . And only Westinghouse load tap changers have Magamp control. J-70875

*Trade-Mark

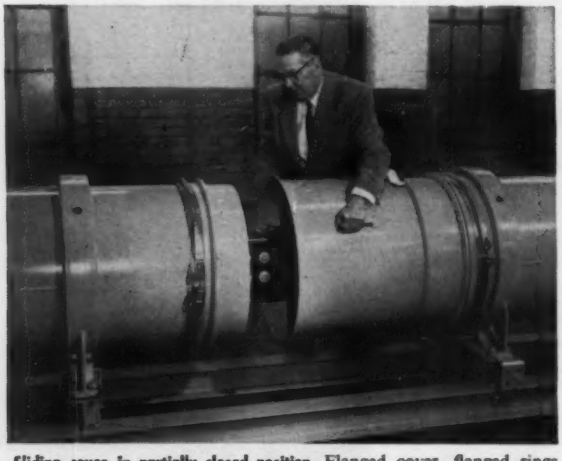
YOU CAN BE SURE . . . IF IT'S Westinghouse

ISOLATED PHASE BUS

Sliding cover in open position. Connectors are easily accessible for assembly and maintenance. High-strength wet porcelain insulators, mounted in compression, are easily reached for inspection and removal.



Connectors can be either bolted or field welded. When bolted, Belleville washers are used to maintain adequate contact pressure. Conductors are either copper or aluminum. All copper connections are silver plated.



Sliding cover in partially closed position. Flanged cover, flanged rings, lifetime silicone rubber gaskets and clamping bands provide a positive seal, prevent dust accumulation, simplify opening and closing.

Sliding cover in closed position. Closure requires only two 1-piece lifetime silicone rubber gaskets—easy to place and remove. Simple, powerful V-clamp band exerts pressure uniformly around the flanged rings.

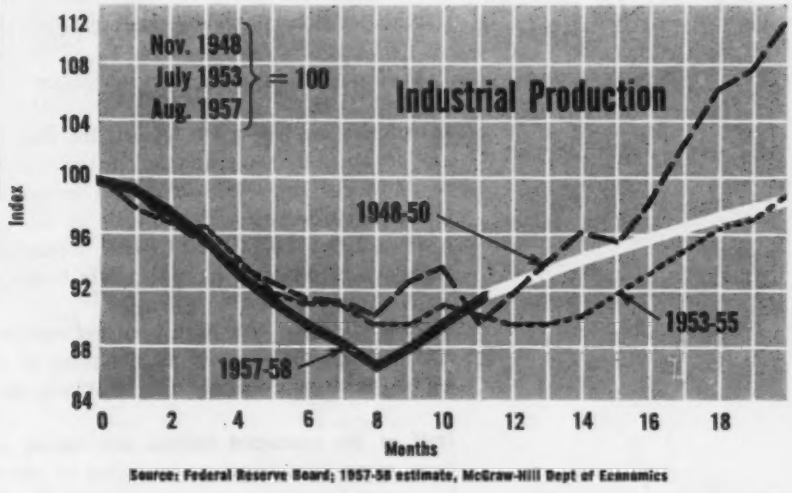
How I-T-E Sliding Covers Reduce Installation and Inspection Time

Sliding covers, well located, to facilitate joint makeup and inspection are one of the many money-saving advantages of I-T-E Isolated Phase Bus. Others include the most simple and efficient of designs; greatest installation flexibility; light weight to save installation time, labor cost, and structural steel; quick, reliable engineering; and excellent delivery.

I-T-E Isolated Phase Bus is available in ratings through 138 kv, through 20,000 amp. Self and forced-air cooled. Send today for Bulletins 10004-A and 10004-B, giving complete information. I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Toronto, Ontario.

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

Report on
Purchasing



Source: Federal Reserve Board; 1957-58 estimate, McGraw-Hill Dept of Economics

Upturn Challenges the Buyers

The sizeable snapback in industrial production and the forecasts for its gradual climb back to pre-recession levels portend both challenges and at least short-term benefits to utility purchasing executives. Implicit in the challenges is the general expectation for some increases in prices which have been held in abeyance during the months of sluggish output. The chief plus factor is "this steadier and more normal economy, away from the idea of boom and bust," as a general purchasing agent in New England put it.

By April, 1959, industrial production will be close to the 1957 high, according to forecasts of McGraw-Hill's Dept of Economics. The industrial production index then will hit 142 (equivalent to 98 on the Committee for Economic Development chart above). In 1956 the high was 147 (1947-49=100). Only a few weeks ago the spring recovery date prediction would have been classed as "optimistic." The Middle East crisis, though, and recent domestic developments have brought some conservative economists into the April-or-so camp.

The pick-up will occasion price increases on utility shelf items, according to ten out of 14 purchasing men surveyed last fortnight on their outlook for the next few months. Of the ten, four pinned the expected hikes on steel and copper items, specifically naming pole line hardware.

Speculative buying isn't in the offing, though, according to Electrical World's random sampling, despite the expectations of price boosts and the spectre of creeping inflation. Louisville Gas & Electric Co, for example, "does not expect enough price increases to make us tie up our money in bigger inventories," said President George R. Armstrong.

The day of keeping a little fat in utility inventories is gone and all but forgotten. This is the conclusion drawn from the survey respondents—none of whom is planning an inventory build-up—and from the tenor of talks before conclaves

of utility purchasing men. This is not to say that reserves for storm damage will not be maintained. But it appears that 90-day supplies are today's maximum because of two reasons:

- Vendors are taking on bigger stocks of shelf items in local or regional warehouses, thus providing quicker deliveries.

- Dollars that formerly went into inventories are needed elsewhere.

Inventories are below 1957 levels for nine of the utilities questioned by EW, four are about the same, and the one that's higher attributes its $1-million increase to oil stocks and other seasonally influenced supplies. A large Midwestern utility pared deepest with a 24% cut; one of its Great Lakes area neighbors is down 20%. For a West Coast company current inventory level is a 30-day supply, a bare-bones status that was being held last year also.

Inventory control men have been put right at the warehouses, where they can ride herd on the supplies all the time, at a Midwestern company. "Before, we had them at a central office," explains the purchasing director.

Half of the contacted utilities are buying on shorter term notice. Most of them (nine) are tailoring shipments to point-of-use warehouses or job sites to save on handling and shipping costs. Scheduling shipments to take advantage of tax savings is a factor, but not a main one, in placing orders by some of the utilities. A good case in point was the delay of substantial shipments of coal orders until after the Aug. 1 lifting of the 4% a ton federal excise tax.

Deliveries are better for 12 of the utilities contacted. One company that commented "suppliers are shipping with inconvenient swiftness" added that in the months ahead "we anticipate shorter delivery schedules than ever before." Said a purchasing director of another company: "You can get almost anything you want."

There'll be no relaxation in utility economy programs as business improves, judging from the 14 EW interviews. For one company the coming months will bring an "even greater intensity for our economy drive." This is bringing a much sharper approach to price escalation. "A supplier really has to prove his case to get an increase now," said the utility's purchasing executive. "We are getting away from 'gold-plated' items and buying strictly for utility." A vp of purchasing in New England said his department's practice has always been on the basis of specific negotiation, not on acceptance of book prices.

Pacific Gas & Electric Co has cut costs by decentralizing shipping. The two-and-a-half-year old program finds everything shipped direct to the point of use instead of the past practice of receiving items at a central warehouse. Much material is sold to the company f.o.b. point of delivery. PG&E also has a decentralized set-up ordering "bread and butter" materials. They are ordered by the using warehouse, although the head office still places the business, negotiates prices, and bills the supplier. Other paperwork is done by the using warehouses. They are given lists of hundreds of items and for each, a choice of two or three manufacturers.

The system cuts paperwork and speeds deliveries. Another form of decentralization lets each division place its own blanket orders on suppliers for building hardware, auto repair parts, and some plumbing supplies. The divisions make purchases and get only a cash tag, although someone signs for receipt of material. The tags are turned in and at the end of the month there is only one invoice. It is paid locally and no accounting has to be done at the general office.

Value analysis is one trend affecting buyers in . . .

An Evolutionary Purchasing Era

Important purchasing trends are interesting more utility managements these days. In varying stages of development, the trends include the industry's long efforts for standardization, value analysis, swifter inventory control methods, and the gradual rise of purchasing men in corporate hierarchy.

Standardization receives its main impetus from the trade associations working in cooperation with the American Standards Association. A big development in post-war years has been organized intra-company standardization.

A company standardization program can pay dividends, the National Assn of Purchasing Agents believes. In its "Standardization Manual," prepared for members only, the NAPA explains how to set up such a program on a continuing basis, whether it be the effort of one man, a committee, or through the creation of a standardization department. The program can efficiently:

- "Pin-point conditions, practices and situations involving inefficiency and excess costs and call to the attention of those interested how standardization can serve to bring about improvements.

- "Assemble information and prepare proposals, suggestions and drafts for the consideration of those who have a specialized knowledge and interest in the subject; or assist committees or task groups established for such purposes."

Top management support is a must for successful standardization and simplification, NAPA stresses. The purchasing executive, because of his knowledge of the company's supply requirements, his experience with vendors, and his materials know-how, must play a key role in the program, according to the buyers' trade group.

Reduction of items carried in stock provides one of the more dramatic examples of how a continuing simplification program benefits utilities. A large company in the East, for instance, handles the job on both a day-to-day basis and on special studies. In a review of carbon brushes used in motors, the stock control department reduced the number from 576 to 375, a cutback of 35%. In the past,

studies of steel items, hardware, valves and valve parts also have produced substantial savings. A scrutiny of wire and cable products is presently underway.

Pacific G&E set up an organization and procedures department in the early Fifties to reduce red tape and paperwork. In purchasing and stores, they followed the same objective and have stressed work simplification even more during the recession.

Value analysis is an essential part of material standardization, explains the NAPA, but is not limited to things standardized. They define value analysis as "the process of objectively studying every item to be purchased, standard or special, and eliminating every cost factor which does not contribute to the value or usefulness of the item."

A good example of how it works was given by Robert E. Shillady, immediate past president of NAPA and retired vp of purchasing, New England Electric System, in a talk before local purchasing groups. "It is throwing money away to pay a premium price for coal having a very high fusing point of ash, such as 2,800 deg to 3,000 deg, if your boilers are designed to satisfactorily burn coal having a fusing temperature of 2,400 deg. Of course, in this case the fusing temperature would not be the only criterion of value, but it is one factor that may bring about a substantially higher or lower price."

An extension of value analysis is the materials management approach, wherein the responsibility for all material is placed under one administrator. "A person in such a position on the company's organization chart can correlate and render more profitable all the functions of procurement, even though some of these may now be handled by seperate departments," says F. Albert Hayes, consulting editor to McGraw-Hill's Purchasing Week.

The materials management concept is not a new one for larger utilities. Hayes maintains that it can be valuable to the smaller company too.

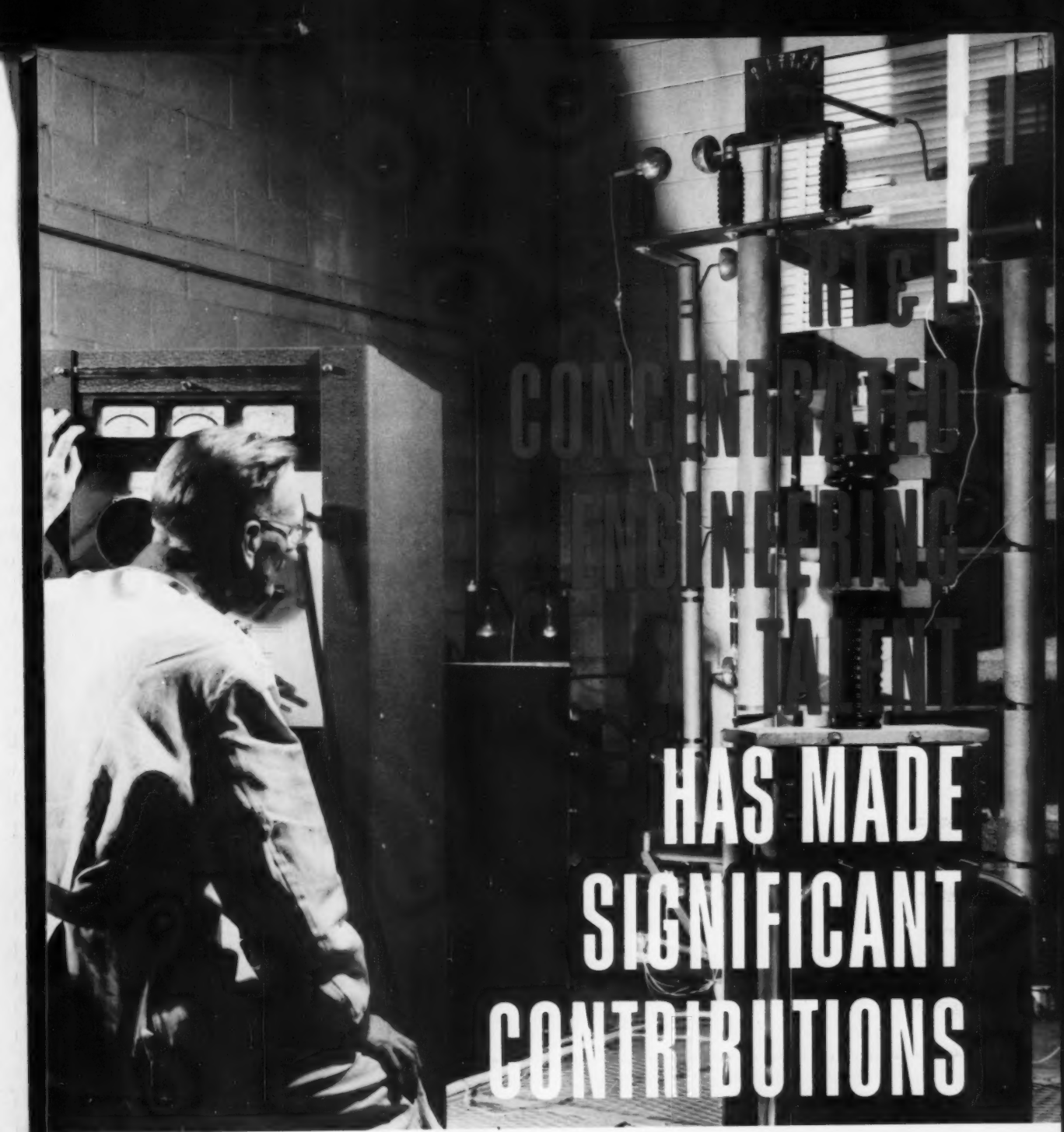
Machine accounting advances promise a big potential in inventory control. Consolidated Edison Co of New York, Inc, in four hours time completes a run-through of the company's entire inventory on an I.B.M. 705 computer. "This means we get an accurate picture as of the moment," said a purchasing executive.

With the 705 Con Edison has determined annual average usage of small items. The big company now is arranging yearly agreements for delivery of the items on a monthly schedule. Through these space-saving steps and the work of the stores control bureau, the company hopes to provide enough space to meet storage needs of the future.

Pacific G&E currently is programming its 705 for inventory control. Smaller machines are providing rapid inventory data at other utilities contacted by EW, with from "excellent" to "partial" success.

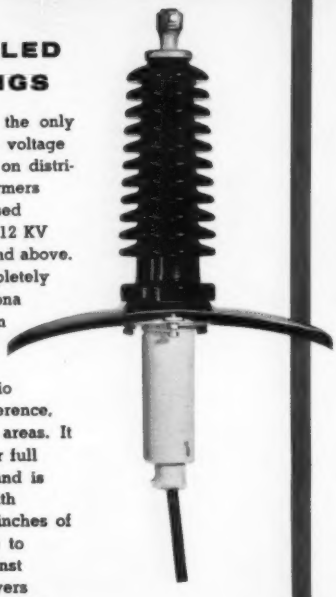
A full scale attack on materials handling costs is underway by a number of utilities. Greater use of fork lift trucks, consolidation of warehouse packaging, and more efficient utilization of building layouts are some of the cost-cutting and space-saving techniques.

In trends affecting purchasing men personally, Purchasing Week surveys indicate there will be more trips to suppliers' plants on the agenda. Specialists in buying, typified in utilities by the fuel purchaser, will join purchasing departments in the growth years of the future. And there will be a stronger rapport between management and purchasing agents as awareness and appreciation of the problems of each becomes better known.



HAS MADE SIGNIFICANT CONTRIBUTIONS TO ELECTRIC POWER DISTRIBUTION

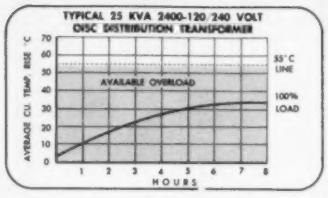
OIL FILLED BUSHINGS



R T & E has the only oil-filled high voltage bushing used on distribution transformers today. It is used in all R T & E 12 KV transformers and above. It almost completely eliminates corona disturbances in the bushing, and thereby eliminates radio and TV interference, even in rural areas. It is designed for full 25 KV class, and is constructed with more than 21 inches of creep distance to safeguard against surface flashovers due to contamination.

IMPROVED VARNISH PROPERTIES

R T & E engineers guided the development work of several varnish manufacturers in the discovery of a new type of thermo-setting varnish. This varnish features 100% cure everywhere in the electrical coil, assuring high mechanical strength throughout the coil and protection against sludging due to varnish. This new varnish has exceptional strength and outstanding aging characteristics.



IMPULSE STRENGTH & OVERLOAD CAPACITY

R T & E transformers are designed for a full wave impulse level at least 50% in excess of NEMA standard requirements. This high insulation strength has been achieved by generously over-insulating at all voltage stress points in the transformer coils. These high impulse levels are substantiated by destruction impulse testing and on-the-line impulse tests.

In addition, R T & E Transformers are designed for a generous overload capacity. This is attained by providing abundant copper in the design, and maximum exposure of coil surface to the cooling oil.

THESE RT&E INDUSTRY "FIRSTS" MEAN YOUR COST LESS TO OWN—BE EASIER TO OPERATE

EXTERNALLY-OPERATED TAP CHANGER

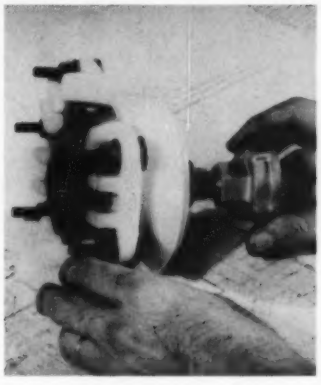
Only R T & E makes the externally-operated tap changer. It is safer and more economical . . . no handhole cover to remove, no unnecessary tank openings, no tap setting confusion, no danger of oil contamination. Switch must be in tap position before handle can be removed. Molded in one piece, multiskirted for long creepage and high surge strength.

IMPROVED WOUND CORE CONSTRUCTION

R T & E introduced the first new concept in wound core construction in 20 years. This new, patented construction method utilizes the finest grain-oriented steel, formed into a compact core having a density 95% of solid steel. High mechanical strength, repairability, light weight, low losses and low exciting currents make this an outstanding core development.

FULLY GUARANTEED PROTECTION

R T & E alone offers an unconditional one year guarantee on all protected type transformers and a full five year guarantee against defects in material and workmanship. Only a manufacturer with full confidence in its product can make such a guarantee. R T & E also maintains complete facilities where it will repair R T & E transformers, another service to the utility industry.



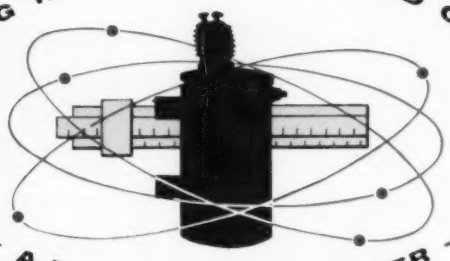
DUAL VOLTAGE SWITCH

R T & E originated the dual voltage transformer with an externally operated primary voltage change-over switch. With this transformer utilities can plan for the future — it provides a fast, simple, time and money-saving means of uprating system distribution voltages.

TRANSFORMERS WILL:

-LAST YEARS LONGER

ENGINEERING TALENT CONCENTRATED ON ONE IDEA



A BETTER TRANSFORMER

Sincere and applied concentration on one specific product increases a manufacturer's chances of becoming more expert in that product than one who diverts his talents. R T & E has devoted all of its creative and production potential to the improvement of the distribution transformer only.

This concentration at R T & E has produced a creative "restlessness", an intelligent dissatisfaction that results in constant product improvement. As a result, R T & E has never been known as a "hitch-hiker" but rather as an aggressive firm unafraid to strike out on untried paths.

This concentration has also produced a willingness at R T & E to meet the needs of customers who require special transformer applications for unusual circumstances. Many of the contributions shown on the preceding page have arisen from work performed in fulfilling these special requirements.

R T & E will continue to concentrate its personnel and plant facilities on the distribution transformer, and will continue as it grows, to render additional significant contributions to the power industry.

R T & E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

Litho in U.S.A. d-m 5

R. J. FOREMAN

Foreman Appointed REA Deputy

Ralph J. Foreman has been made deputy administrator of the Rural Electrification Administration, it was announced by the Department of Agriculture. He succeeds Fred H. Strong who resigned on July 11.

Foreman is a career employee of REA. He joined the agency's staff as a field representative in January, 1949, and worked with electric co-operatives in Midwestern and Great Plains states. He worked his way up the ladder, and was special assistant for power supply in the office of the Administrator at the time of his appointment as deputy.

Before joining REA, Foreman was manager of the Southeastern Michigan Rural Electric Cooperative at Adrian, Mich. He was born in Homer, Ill., in 1909. After studying at the University of Illinois, he was employed by the Central Illinois Electric & Gas Co in the area of Lincoln as groundman, lineman, serviceman, engineer, and district manager. From 1942 to 1945 he served with the U. S. Navy on the West Coast and in the Pacific as chief electrician and chief warrant officer.

Romano Elected Federal Pacific Vice President

John T. Romano has been elected a vice president of Federal Pacific Electric Co, according to an announcement by L. W. Cole, chairman of the board of directors.

Romano has been with Federal Pacific for 13 years. Before his election to vp, he served as manager of the firm's Distributor Products Division. He joined Federal Pacific as a cost accountant in 1941, moving from this part of the business into production and production planning. He became plant manager at Newark in 1948, and in April of this year was named a vice president of Roller-Smith, Inc, a FedPac subsidiary.

Romano was educated at Fordham University and at Pace College. His past experience includes service with Republic Aviation Corp and Sears Roebuck & Co. He is a member of the American Management Assn.

J. T. ROMANO

Three Managers Named at Kaiser Aluminum & Chemical

J. C. FERGUSON G. N. HOUCK R. J. HARRISON

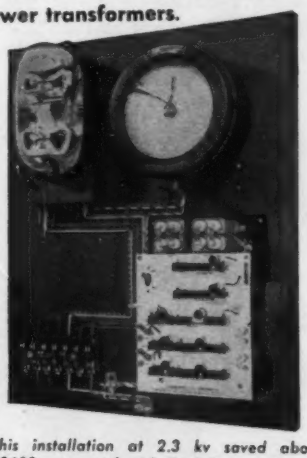
The appointments of Gillette N. Houck as manager of promotion and technical development, J. Carl Ferguson as general sales manager, and R. J. Harrison as manager of utility sales of the Electrical Conductor Division, Kaiser Aluminum & Chemical Corp, have been announced.

Houck, formerly ECD sales manager, joined Kaiser in 1947, and has held a variety of sales and executive sales positions. Ferguson came to the company in 1949. Previously he had served as a salesman at Kansas City, Mo., assistant product manager, and most recently, ECD product manager at Chicago. Harrison started with the company in 1950 as a salesman.

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now FREE

Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.

PERSONAL BRIEFS

Donald H. Anderson has become manager of the industrial development department of the Oklahoma Gas & Electric Co, succeeding **Wayne A. Darden,** resigned.

Harold L. Gerrish has retired as chief of the electrical and telephone division of the Maine Public Utilities Commission to enter private consulting practice at Augusta on utility management and finance in the New England area.

New England Electric System has made these recent promotions: **Frank E. Caufield,** power sales manager, Merrimack-Essex Electric Co, has gone to Narragansett Electric Co as assistant power sales manager. **Fenton W. Varney** has become power sales manager at Merrimack-Essex Electric. **Walter J. Staples** has moved to Merrimack-Essex at Salem as power sales supervisor. **Walter B. Pepper,** power sales supervisor, Worcester County Electric Co, has become power sales supervisor at Suburban Electric Co and **John F. G. Eichorn, Jr,** formerly of the power sales department of Suburban Electric, is now with the power sales department at the Boston office of New England Power Service Co. **Elbert S. Luther** has been named assistant to the advertising manager of NEPSCo. **Rexford S. Kidd** has been made downtown manager (Worcester) of Worcester County Electric Co.

K. S. Wingfield has resigned as administrator of the Arizona Power Authority in order to enter private consultation work.

Iowa Power & Light Co has advanced **William R. Foster** from sales manager at Council Bluffs to district manager, succeeding Vern T. Beats, retired.

Minnesota Power & Light Co has promoted **Jack F. Rowe** from an engineer in the general engineering department to assistant chief engineer.

Atomics International has made **Chris J. Brous** assistant chief of engineering.

Harold E. Marmaros has been appointed manager of the economics department, Middle West Service Co.

New manager of marketing department, General Electric Co computer section, is **George A. Hagerty.**

Sel-Rex Corp has made **Sid Mitwol** general manager of its Rectifier Division.

Homer M. Sarasohn has been appointed director of engineering planning on the corporate staff, IBM Corp.

Recently appointed manager of the standards department, Westinghouse Electric Corp materials engineering department, was **Frank V. Kupchak.**

Hughey & Phillips Inc, has appointed Frank J. Little, Jr, East Coast sales engineer, Washington, D. C.

Recently appointed general manager of the forging division, Brewer-Titchener Corp, was **Fred Stidfole.**

Dr Charles F. Wagner, consulting engineer for the Apparatus Division of the Westinghouse Electric Corp, has been awarded the Westinghouse service pin in honor of his 40 year career with the company.

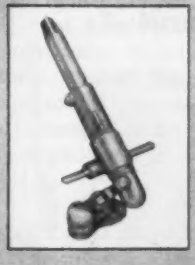
Harvey Hubbell, Inc, has taken on **William H. Gatenby** as assistant to the general manager. He was formerly with Ford Motor Co.

General Electric Co has made these personnel changes in its large steam turbine-generator department: **Edward H. Miller** has been made manager-turbine advance engineering and **Robert C. Spencer, Jr,** has been appointed turbine advance design engineer.

J. C. Thorburn has been named manager of Westinghouse Electric Co's manufacturing and repair plant in South Boston, Mass., succeeding **R. E. Meuhlig,** who becomes manager of the company's northeastern region, M & R divisions.

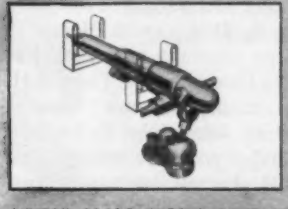
1. SWITCH BLADE IN FULLY OPEN POSITION

Universal link connects blade and crank arm for transmitting forces to the switch blade for full cycle of operation.



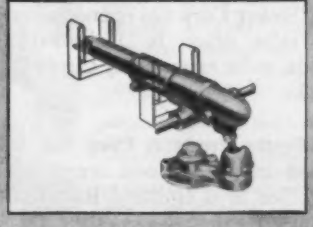
2. SWITCH BLADE CLOSING

Switch blade is moved from the open to closed position by a relatively small angular motion of the crank arm.



3. SWITCH BLADE ENTERS CONTACTS

In this position the switch blade begins its rotation for full contact engagement. Continued movement of the crank arm will rotate the blade to bring contacts under high pressure.



4. SWITCH WITH CONTACTS FULLY ENGAGED

The simple linkage of the WAG concentrates mechanical advantage so that contact engagement or disengagement is accomplished with a minimum of effort.

Simple **WAG** linkage boosts mechanical advantage; lessens operating effort

In one sweeping, continuous movement the Type WAG Switch blade swings into the open or closed position. There is no lost motion — no cams, triggers, or latches.

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Thus, the Type WAG offers the advantages that engineers recognize as so important: a switch easy to operate, higher contact pressure, and wider contact deflection. The Type WAG has the muscle to break up heavy concentrations of ice and to operate dependably under the most adverse conditions.

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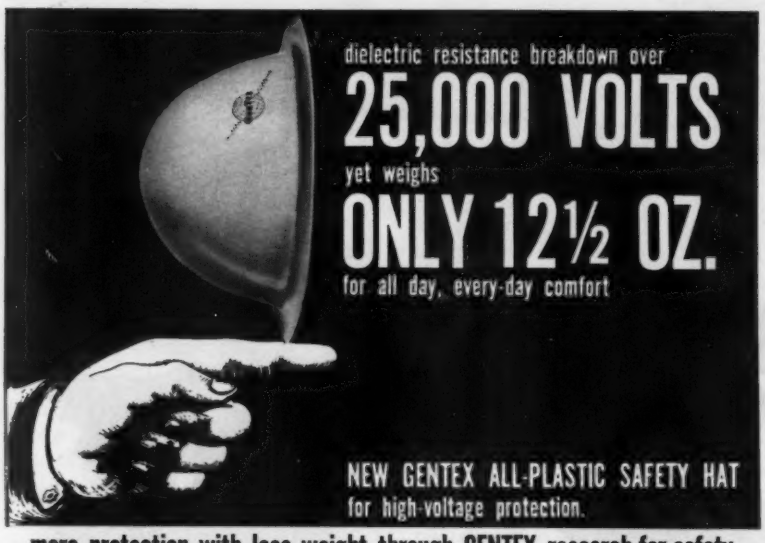
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



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SALES ASSIGNMENTS

COMPANY STAFFS

Joseph T. Ryerson & Son, Inc, has realigned its sales personnel in the aluminum field. Named to head the aluminum sales department is L. Paul Lee who has been manager of stainless steel sales. He will continue in the latter capacity. Norman Lynch has been assigned to the aluminum sales desk in the general order department of the company.

Bakelite Co, division of Union Carbide Corp has appointed John F. Mulhern as technical sales representative. He will handle south central Illinois, central Indiana, and parts of Kentucky and Virginia. He will operate out of the company's Cincinnati office.

Federal Pacific Electric Co's Pacific Switchgear Division has formed a new inside sales group to service utility and industrial high voltage apparatus customers. New group absorbs the existing divisional application engineering section and will be known as the divisional sales section. The section will be managed by Glen A. Dusch, with Henry L. Brooke as assistant manager. Reporting to Dusch will be Thomas H. Orrock, manager-circuit breaker and bushing sales, John E. Samuelson, manager-power switching sales; Walter E. Farrell, manager-transformer sales, and Robert L. Zipprich, manager-customer services.

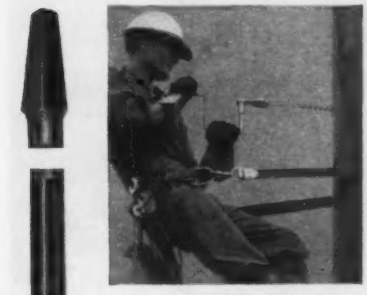
Nordberg Manufacturing Co has named Emmons L. Farrell Minneapolis district manager of the company's engine division.

Riley Stoker Corp has opened a district sales office in Jacksonville, Florida, to be managed by Curtis W. Novak.

Rockbestos Products Corp has relocated its West Coast warehouse and office at 6 Guittard Rd., Burlingame, Calif.

Westinghouse Electric Corp promoted David H. Nelson to St. Louis district sales manager for the Lamp Division.

ONE BIT FITS BOTH



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2. Electric Drill

New Irwin Adapter Shank Wood Bit

Now you can eliminate the need to stock two types of wood auger bits. Irwin's new Adapter Shank Bit fits both hand braces and power drills.

With hand braces, use the Adapter Shank Bit as it comes. Cut off taper square and the Adapter Shank, with its 6 "hex flats", chucks perfectly in power drills or hand braces, either one. No wobble, no run-out. Clean, efficient cutting action. Reduces inventory and record keeping by 50%. Saves time on the job, too. Call your distributor, or write today for complete information. Sizes 4/16" to 17/16", both solid center and single twist types.

All Irwin Adapter Shank Wood Bits are forged in one piece from special steel and heat tempered full length for longer life. Plastic coating on balanced cutting heads guarantees factory-fresh sharpness, unequalled performance. Widely used by utilities, electricians and construction workers.

IRWIN auger bits • screw drivers

Wilmington, Ohio

Books

Where Does Heat Go?

Elements of Heat Transfer, Third Edition. By Max Jakob and G. A. Hawkins. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N. Y. 308 pages, illustrated. Price $6.75.

This book is for the student or the equipment design engineer concerned with heat transfer problems. The new edition contains information on thermal conductivity of liquid metals, thermal analyzers, heat exchanger effectiveness ratio, gas radiation, and—something the students will like—25% more problems.

Survey of Synchronous Motors

Synchronous Motors and Condensers. By D. D. Stephen. Published by Chapman and Hall, 37 Essex Street, London, W.C. 2. 493 pages, illustrated. Price 60s.

Design, application, protection, and control of synchronous motors and condensers are given a detailed treatment in this book. Most of the material in the book is of a descriptive nature. There is very little mathematical treatment.

Electromagnetism Explained

Introduction to Electromagnetic Fields. By Samuel Seely. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y. 299 pages, illustrated. Price $8.50.

Starting with an explanation of equipotential lines of a current field, the author guides the reader of this text clear through to the complexities of Maxwell's Equations. A thorough background in mathematics is necessary for an understanding of this book.

Books Recently Received

Operational Mathematics, Second Edition. By R. V. Churchill. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 320 pages, illustrated. Price $7.00.

Basics of Digital Computers (Volumes 1, 2 & 3). By J. S. Murphy. Published by John F. Rider Publisher, Inc, 116 West 14th St, New York 11, New York. 416 pages, illustrated. Prices $2.50 per volume . . . 3 volume set $6.95, all three volumes in single cloth binding $7.95.

Electricity in Agricultural Engineering. By T. E. Hienton, D. E. Wiant & O. A. Brown. Published by John Wiley & Sons, Inc, 440 Fourth Avenue, New York 16, N. Y. 375 pages, illustrated. Price $7.75.

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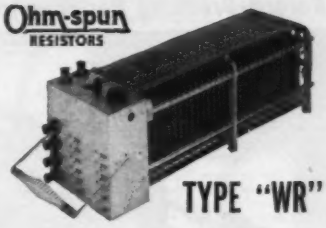

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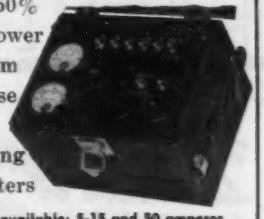

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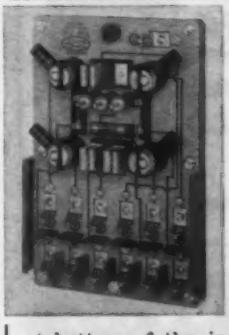

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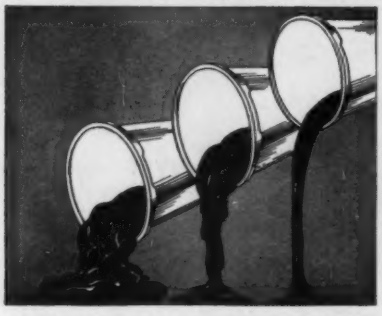

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500-Mw Nuclear Plant Takes Form

Foundation work is in progress on the first reactor for the world's largest atomic power plant at Hinkley Point, in Somerset, England. The 500-Mw station is being built for the Central Electricity Generating Board by the English Electric Co, Babcock & Wilcox, and Taylor Woodrow Atomic Construction Co. It is scheduled for 1962 operation.

The Hinkley Point station will have two natural uranium, graphite-moderated, gas-cooled reactors supplying heat for 12 boilers. The boilers will supply steam for six turbo-generators.

On a recent U. S. business trip, H. S. Arms, Chief Engineer, Atomic Power Div, English Electric Co, said that the anticipated cost of power from the station was 7.6 mills per kwhr.

Nuclear Notes

The preliminary design and development contract between the Atomic Energy Commission with Nuclear Development Corp of America has been extended. It provides $2.3 million to "establish the potential of the concept" of a sodium cooled, heavy water moderated reactor system as an economic power producer and also to modify the present design for construction of a pilot plant using natural uranium.

A five-year agreement formalizing and expanding exchange of information between Power Reactor Development Co and United Kingdom Atomic Energy Authority has been signed by both parties, according to Walker L. Cisler, PRDC head.

Atomic stations with installed capacity of up to 600 Mw are under construction in the Soviet Union, said a U. S. S. R. Academy of Science professor on the fourth anniversary of her first atomic power plant. Experimental work, he said, may lead to reactors operating in "a state of ebullition, needing no complicated system of boilers; the steam being directed straight from the reactor to the turbines."

Elk River, Minn., nuclear plant contract will cost AEC some $11,445,000. This includes cost-type pact with a $9,269,000 ceiling, including fixed fee, for Nuclear Products-Erco Division of ACF Industries, Inc, which will develop, construct and test the closed-cycle BWR plant. Conventional portion will be provided by Rural Cooperative Power Association for about $1,750,000.

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200	BDGWY	2300	250
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150	G.E.	440	250/275
150	WEST	2300/4600	250/125
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Readers Forum

Recognition for AIEE Fellows

I was pleased to note in the August 4th issue of the Electrical World recognition given to the engineers who were awarded Fellow grade in A.I.E.E. Perhaps I have missed this in previous issues.

For some time it has seemed as though more publicity should be given to men who are recognized by the Fellow grade in any of the engineering societies. This is a step in that direction.

Russell G. Warner
Consulting Engineer
10 Knoll Drive
Hamden 18, Connecticut

Error in Definition

To the Editor:

I would like to call your attention to a rather glaring error in a definition on p 64 of the July 14 issue of Electrical World.

The discussion begins with the phrase "Equivalent diameter of a stranded conductor is a circle—etc." This is followed by a more specific statement, quoted from some source, which begins "The equivalent diameter is a circle—etc." I am sure you see the point.

The lack of ability of engineers to express themselves correctly is certainly well illustrated when our technical publications carry such statements.

Submitted in the interest of better engineering communications.

Howard M. Hess
Associate Dean
Wayne State University
College of Engineering
Detroit 2, Michigan

Not Ohio Power

To the Editor:

On page 58 of the August 4 issue of Electrical World under the heading "Rates and Regulations," we note the following:

"A 26.8% rate increase sought by Ohio Power Co for power sold to the village of Wellington has started a move by the city to get back into the generating business."

For your information, Ohio Power Co does not serve the village of Wellington."

E. A. Berry
Ohio Power Co
Canton 2, Ohio

We erred. It should have been Ohio Edison.

Travel Saves Research

To the Editor:

For the past year or so one notices in American technical journals articles on the utilization of a higher secondary voltage, and usually the author places much stress on the need for research and study as to the benefits.

One is tempted to wonder why research and study, which costs considerable time and money, is required when almost similar conditions of supply, the 240/416 system, have existed the other side of the "pond" for half a century.

The advantages gained by the higher voltage which most of the articles go at some length to justify have also been apparent and enjoyed by both consumers and utilities for years.

As a suggestion, would it not be better to arrange an exchange of ideas with our colleagues in Europe, instead of spending time and money on research? No doubt our electrical institutions could be of assistance but personal contact between the engineers who carry out the work would be more positive. This may best be achieved by an exchange of visits when both parties would learn much from each other to the advantage of both.

John Appleby
Chief Engineer
Luz Electrica De Venezuela
Caracas, Venezuela

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A new digital computer for automatic air navigation and bombing will perform 62,500 computations per second. It is said to be the fastest airborne system.

&

Theoretically, small hydrogen bombs exploded at the rate of two an hour in an underground chamber, could produce twelve per cent of all the electric power in the United States.

&

Belt drive through variable-speed pulleys is used in a new foreign automobile.

&

Short wave radio signals have been transmitted half way around the earth without material distortion by reflecting them from a flat spot on the moon. The method might be used for intercontinental telephone calls.

&

A church in the tropics has a concrete roof covered with sprayed-on white synthetic rubber. It reflects heat and has proved to be economical in application and maintenance.

&

Plans have been announced for a power transmission line to carry 750 kv, about twice the voltage now carried in this country.

Sound waves are being used to weld aluminum foil.

&

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Nuclear batteries appear to be the most promising power source for the electrical systems of satellites. Heat produced by the radiation from an isotope is converted by a thermocouple into electricity.

&

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

&

Powdered metal parts can now be made up to thirty inches in diameter.

&

A radio that can be carried in the hand is said to be the first tubeless two-way set for use in VHF mobile communications.

&

A supersonic burglar alarm gives a warning whenever there is the slightest movement of anything within its area.

&

An electronic instrument can be made to talk in any language. Coded signals sent to it are converted into actual speech.

&

New fluorescent highway lamps, believed to be the most powerful in the world, give 55,800 lumens of light.

&

A car-sized heat pump is being developed that will cool or heat an automobile interior.

Waterproof, heat-sealed shipping bags made of polyethylene film are said to be stronger than those made of conventional materials.

&

A tape recording system has been designed that will monitor twenty-eight radio frequencies simultaneously twenty-four hours a day.

&

A ceramic paint has been developed that does not have to be fired, will not flow at high temperatures and dries in thirty-five minutes.

TIREX® is TOUGH

"TIREX" is the trailing cable that feeds power to this giant strip mining shovel. "TIREX" cords may also carry the current to your workshop tools and be subjected to the rigors of life on portable saws and sanding machines. Tough, flexible "TIREX" assures you of long, unfailing service and unequalled economy. That's why manufacturers of quality products insist on "TIREX"® (*made only by* SIMPLEX).

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
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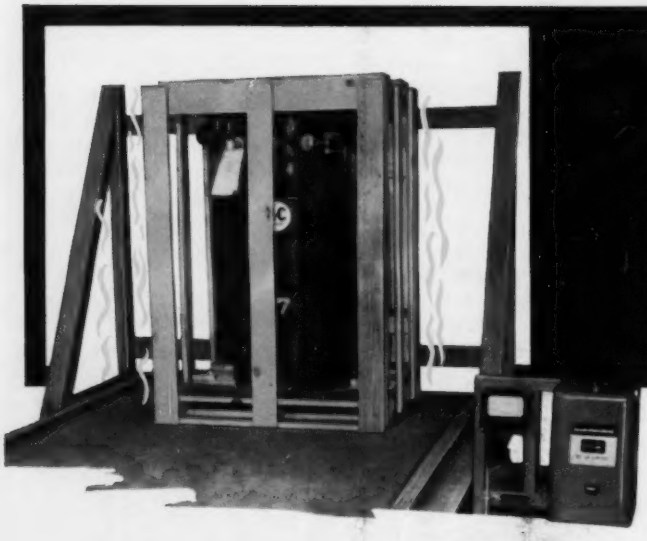
"The American manufacturers of transoceanic telephone cables"

There's a good reason WHY...



Allis-Chalmers

RESEARCHES CRATE DESIGN

Distribution transformers arrive in FACTORY CONDITION

EVERY conceivable type of transportation rigor is simulated—the Gaynes Package Tester, shown above, duplicates freight car and truck conditions of speed, irregularities of track and road, action of truck springs. The Conbur Incline, a shock-imparting machine, subjects crated transformers to various impacts sustained in actual shipment — crates are designed to provide maximum protection. A seal certifying approval by the National Safe Transit Committee appears on every Allis-Chalmers crate — further assurance that transformers are ready to give you years of dependable service.

This is only one of the many good reasons why Allis-Chalmers distribution transformers assure outstanding performance for many years. For *all* the good reasons, call your A-C man, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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